AVIATION WEEK

50 CENTS

HE'S SINKING

AN UNSEEN

SUB

DESIGN ENGINEERS started with the latest electronic gear to seek a submerged sub and the armament to sink it. Around this mass, they created an aircraft. With slide-rule and calculator, they flew her on paper.

From these flights in figures, and from models in wind tunnels, came data demanding change. Often formulae gave the answer, often the ingenuity of Grumman specialists in aerodynamics, stress, weight control, metallurgy, and production.

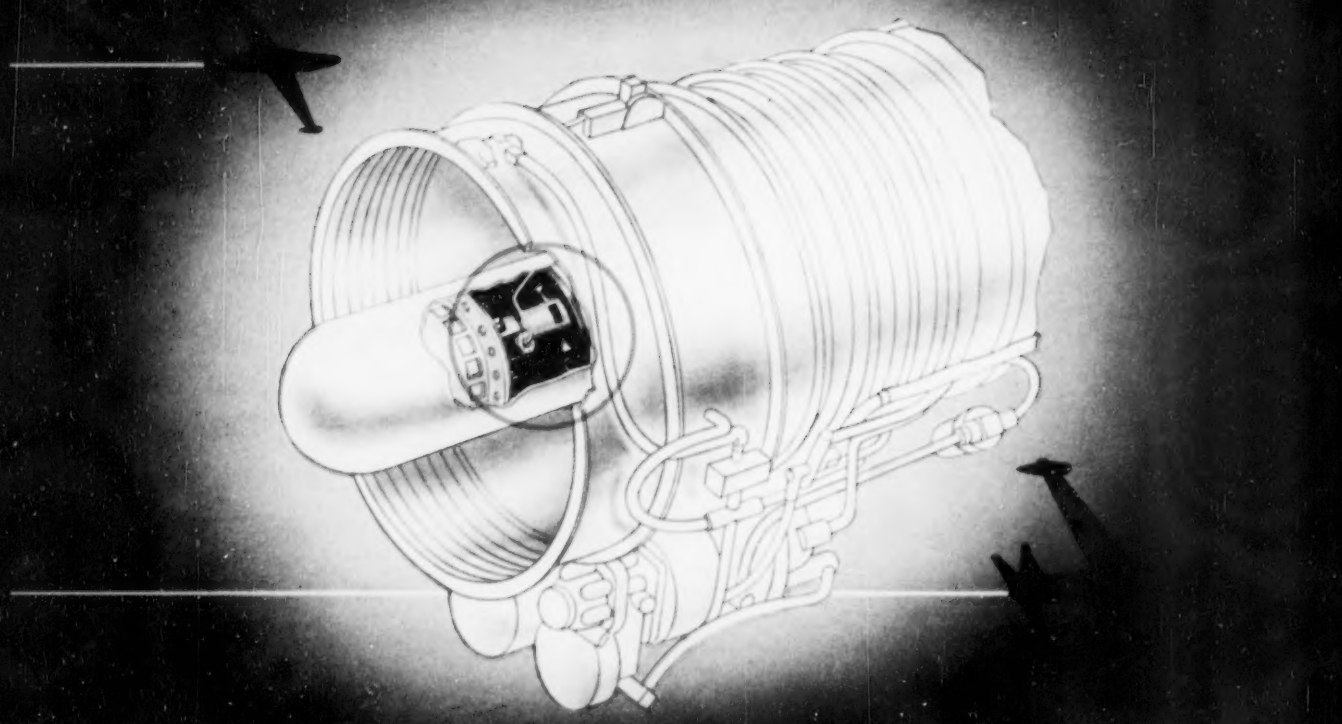
They detailed her anatomy, until all her thousands of parts were ink lines and numbers. These became metal, hand cut and formed with precision. Carefully the first experimental model was built.

But long before the Grumman S2F-1 flew and confirmed their figures on paper, they were busy on a revolutionary new fighter plane.

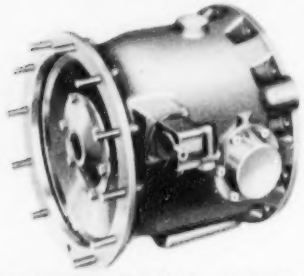
Grumman salutes National Engineers Week.

GRUMMAN AIRCRAFT ENGINEERING CORPORATION · BETHPAGE · LONG ISLAND · NEW YORK

SUNDSTRAND



Nose cone mounting of Sundstrand Constant Speed Drive requires less space, less weight, eliminates separate oil reservoir



"SANDWICH MODEL" OFFERS EXTREME COMPACTNESS

Mounted in the nose cone, or on another available pad, this type of drive is extremely compact, of lighter weight. Engine oil can be used. No separate reservoir or oil cooler required. Installation and maintenance simplified, since unit is bolted to engine. Maintains high efficiency, even at extremely high altitudes.

Sundstrand designers have continued their development work to provide you with the exact type of Constant Speed Drive which will best meet your airframe or engine design requirements. Each of the drives employs the fundamental principle of precise speed conversion developed by Sundstrand in cooperation with the Armed Forces and leading manufacturers in the aircraft industry. Each of the drives has the precision construction and reliable performance which have built Sundstrand's reputation. Each of the drives has special characteristics developed for a specific type of application. For a complete review of all models available, and suggestions on applications to *your* design problem, get in touch with us. Take advantage of Sundstrand's *reliable* research, *expert* engineering, and *precision* production.

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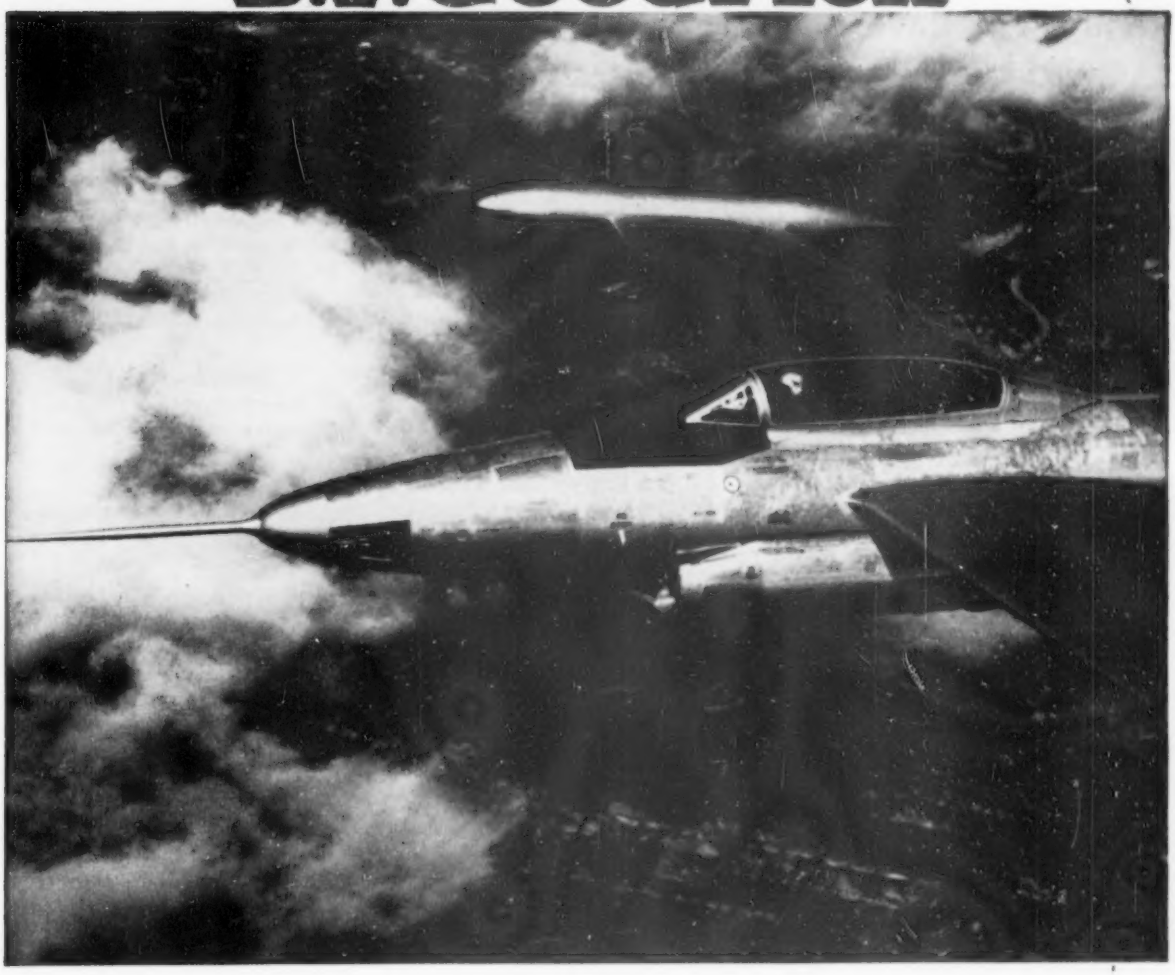

8 miles high without bubble trouble

THE CANOPY BUBBLES on fast military airplanes, like the Northrop Scorpion above, had to be safely pressurized at altitudes of 8 miles or higher. But the ordinary inflatable seals between bubble and cockpit couldn't take the effects of high pressures on the inside, low pressures on the outside.

B. F. Goodrich engineers, called in by the customer, studied the problem. A really effective seal, they believed, should stretch very little or not at all. Less stretch would mean lower pressure, less strain. They worked out a seal with a solid base fastened to the rim of the cockpit and a rubberized fabric covering that simply *lifts* when inflated to form the sealing tube. When this tube inflates, it works like blowing up a paper bag—low pressure brings it to its full expansion and doesn't stretch the fabric enough to notice it. Dangerous stretching of tube wall (like blowing up a toy balloon) is eliminated.

The new seal works almost instantly. Even at minus 65° it inflates with less pressure than old-type seals needed at room temperature. There are other advantages. It resists wear and damage better than ordinary seals. It fits complex curves better. It seals and unseals faster. Sliding wear and scuffing are minimized. It has proved so superior that it has been adopted by McDonnell Banshee, Chance Vought Cutlass, North American Sabre and other airplanes besides the Northrop Scorpion.

This new type seal is one of many developments for aviation that has come from B. F. Goodrich rubber research and engineering. Other aviation products include tires, wheels and brakes; heated rubber; De-Icers; Avtrim; Plastilock adhesives; Pressure Sealing Zippers; fuel cells; Rivnuts; accessories. *The B. F. Goodrich Company, Aeronautical Division, Akron, Ohio.*

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Aviation Week

ABP Member ABC

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the old american custom is still new

To fly by the seat of your pants back in the roaring twenties was high adventure . . . and a lot of it made history. Western Air Lines' M-2, for example, blazed many a new trail in commercial aviation back in 1926 when "America's oldest airline" began flying the West.

The American custom of pioneering is still going strong, as evidenced by Western's addition of new four-engine DC-6Bs for service between leading cities on the Pacific Coast, and on Western's new route between Minnesota and California. We're proud that Janitrol heaters serve well on these fine aircraft — as, indeed, they do most aircraft in commercial service. Our Janitrol representatives are pioneering, too, and are always on hand to help design, build, or maintain aircraft combustion equipment.

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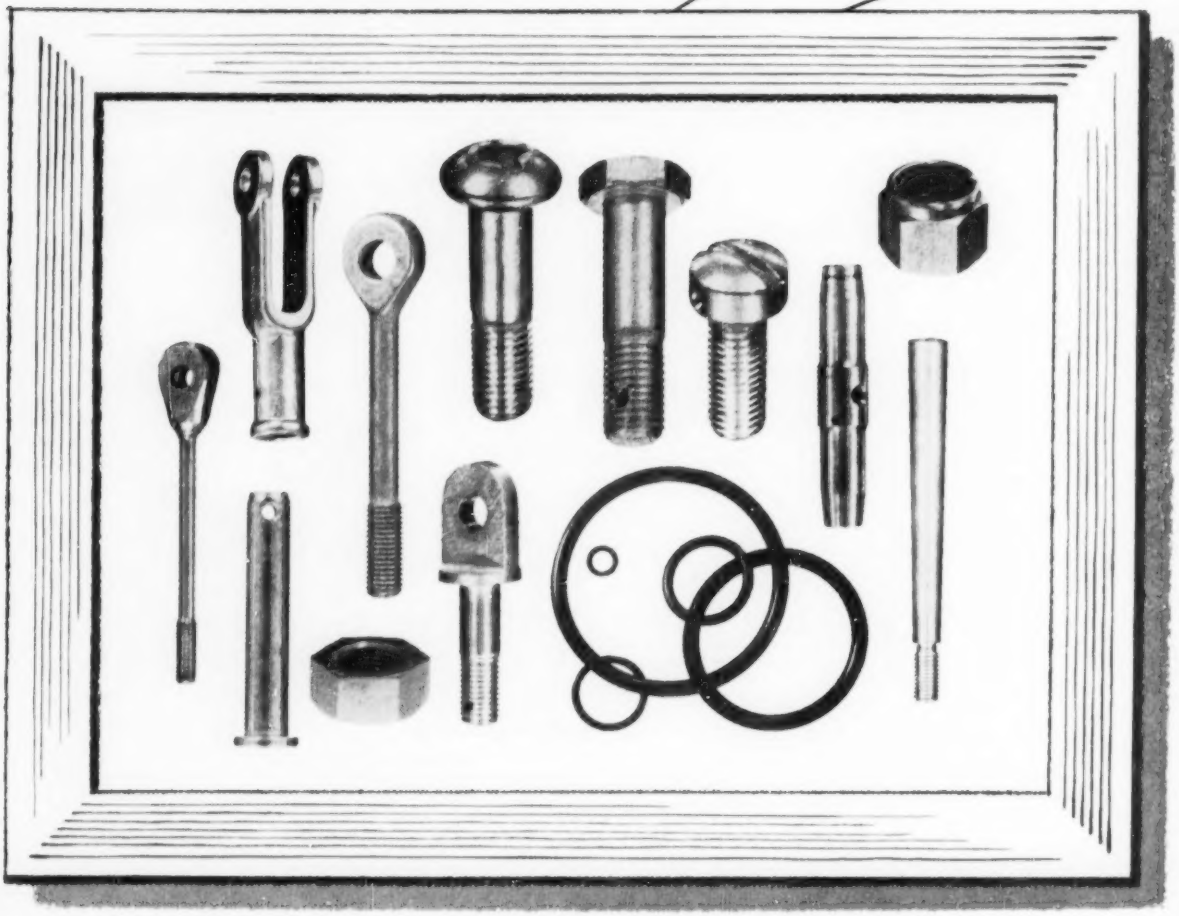
CLASS PICTURE -'53



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NEWS DIGEST

Domestic

Deputy CAA administrator Fred B. Lee last week appeared to have a clear track for the Eisenhower nomination as administrator, and announcement of the nomination was expected momentarily. Meanwhile, appointment of the fifth member of Civil Aeronautics Board was expected to be made shortly, with former Rep. Harmar D. Denny, Jr., of Pennsylvania apparently favored. Denny has strong Republican organization backing from Sen. James H. Duff and former GOP national chairman Hugh Scott.

More than 1,500 striking UAW-CIO production workers returned to their jobs last week in Fairchild Engine Division plants at Farmingdale and Valley Stream, N. Y., ending a 25-day-old wage walkout. A new labor contract was ratified, with pay increases ranging from 10 to 15 cents an hour and other benefits. Company refused to agree to a union shop.

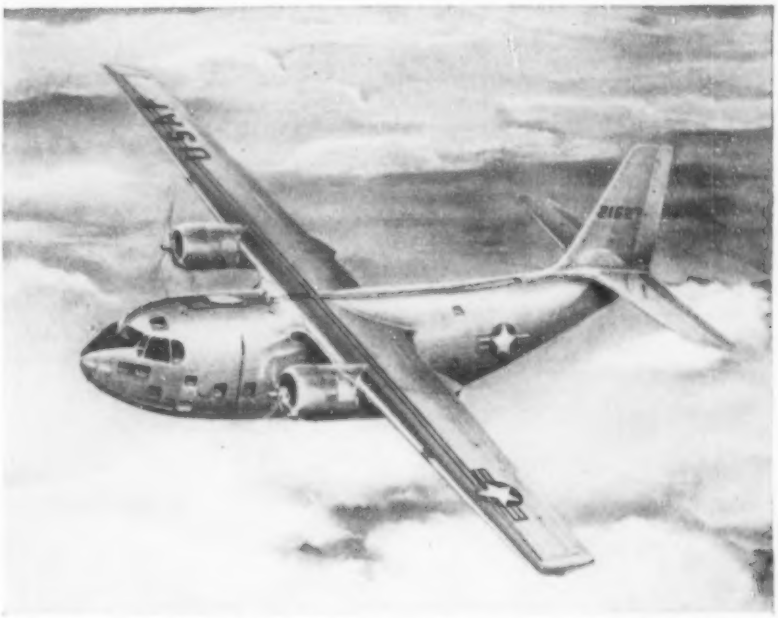
Wayne Major Airport in Detroit may become the nation's first airfield with naturally air conditioned passenger terminal, hangars and shops. A byproduct of negotiations with the International Salt Co. for mineral rights under the field is a proposal that air be brought up from a salt mine through shafts and circulated through airport buildings—dropping temperatures to an estimated 62 deg.

Convair's new turboprop-powered R3Y flying boat, fastest large seaplane to be developed, has been named the Tradewind.

A British Spitfire Mark 24 flown by an American pilot is the only U. S. entry in the 400-mph. speed class of the 1953 International Air Race, London to Christchurch, New Zealand, Oct. 10. Peter D. Freytag, president of American Aircraft Corp., Teterboro, N. J., will pilot the World War II fighter plane.

Wage increases that will add an estimated $700,000 a year to Convair's San Diego Division were granted by a labor contract signed this month with the Engineers and Architects Assn. (Ind.). In Texas, Convair's Ft. Worth Division reports production of the B-36 six-engine bomber this year involve 2,196 subcontractors and suppliers of parts and service.

Herbert N. Eaton, aircraft instrument and hydraulic engineering expert, has retired as chief of the hydraulics section of the National Bureau of Standards.



PRODUCTION CHASE C-123B Air Force transport will vary only slightly from the prototype this artist's sketch reveals. Most noticeable difference is a new squared-off fin and rudder. The firm, in conjunction with Kaiser-Frazer, will turn out a sizeable quantity of C-123Bs for assault transport use. Powered by two P&WA R2800-99Ws of 2,500 takeoff horsepower each, the new Chase will have a top speed in the neighborhood of 245 mph. and a range of some 2,000 mi. First production model has been completed at Chase's West Trenton, N. J., plant.

Heinze E. Schrader, assistant vice president of Western Gear Works, Lynwood, Calif., died Feb. 2.

Financial

Continental Motors Corp., Muskegon, Mich., reports record high sales totaling $264,219,009, net earnings of $6,126,021 during the last fiscal year.

Lockheed Aircraft Corp., Burbank, will pay a 37½-cent dividend Mar. 14 on each capital stock share to stockholders of record Feb. 20.

International

A 1,500-mph. gyroscopic fighter plane capable of vertical climbs is in the planning stage at Avro-Canada's Malton, Ont., plant, reports from Canada say. The new flying saucer-type aircraft is expected to have a powerplant that will revolve around a central control cockpit. Air Vice Marshal Douglas Smith, chief of Royal Canadian Air Force technical services, says the RCAF is "giving preliminary consideration to a project of this nature, but we have not gone beyond the thinking-out-loud stage."

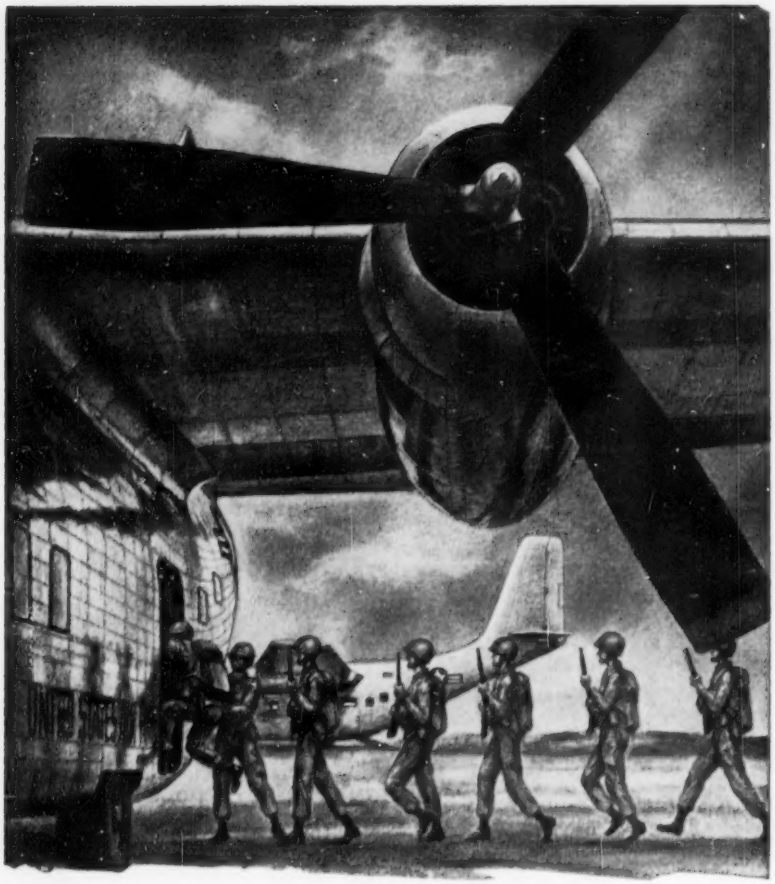
Avro Canada reports completion of official type-tests of the first Canadian jet engines, the Orenda 8 for CF-100 aircraft and the Orenda 10 for F-86 Sabres being built by Canadair.

British Overseas Airways Corp. will begin Comet jet liner flights Apr. 3 between London and Tokyo, reducing time for the 10,200-mi. trip to 33¼ hr.

Aerlinte Eireann Irish Airlines will begin scheduled trans-Atlantic flights next year using Seaboard & Western Super Constellations and crews.

Royal Canadian Air Force expenditures for 1953-54 fiscal year are estimated at $936 million, nearly half of the National Defense Department's proposed budget of $2,000,795,000. Of the RCAF's total funds, $420 million is earmarked for jet fighters.

Canadian Defense Minister Brooke Claxton accepted delivery this month in Montreal of the first of 500 T-33 jet trainers ordered by the RCAF from Canadair, Ltd.



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AVIATION CALENDAR

Feb. 23-24—Conservation Panel of the Aircraft Industries Assn., Convair plant, Ft. Worth, Tex.

Feb. 28-Mar. 1—Seventh annual Pacific Coast Mid-Winter Soaring Meet, Torrey Pines Glider Port, San Diego, Calif.

Mar. 10-11—Eleventh Annual Conference, Society of the Plastics Industry Canada, Inc., General Brock Hotel, Niagara Falls, Canada.

Mar. 17-20—21st Annual Meeting, American Society of Tool Engineers, Hotel Statler, Detroit.

Mar. 23-25—Third Midwestern Conference on Fluid Mechanics, University of Minnesota, Minneapolis.

Mar. 23-26—Institute of Radio Engineers National Convention, Waldorf-Astoria and Grand Central Palace, New York, N. Y.

Mar. 23-27—Eighth Western Metal Exposition and Congress, Pan-Pacific Auditorium, Los Angeles.

Mar. 23-28—Congress of Civil Aviation Conference, a joint meeting of trade organizations; theme: 50 years of aviation progress. American Association of Airport Executives is holding annual meeting simultaneously, Kansas City, Mo. Contact convention manager, Ross C. Roach, P. O. Box 315, Kansas City 41, Mo.

Mar. 25-27—National Production Forum of the SAE, Hotel Statler, Cleveland, O.

Mar. 31-Apr. 2—First International Magnesium Exposition, National Guard Armory, Washington, D. C.

Apr. 4-12—Second Annual International Motor Sports Show, Grand Central Palace, New York, N. Y.

Apr. 20-23—Aeronautic Production Forum, National Aeronautic Meeting and Aircraft Engineering display (SAE), Hotel Governor Clinton and Hotel Statler, New York, N. Y.

Apr. 20-May 2—Annual Conference of Technical Committee, International Air Transport Assn., Caribe Hilton Hotel, San Juan, Puerto Rico. Helicopter Symposium will be a principal feature.

Apr. 25-May 2—First annual National Transcontinental Handicap Air Cruise for private planes of 300 hp. or less, Philadelphia to Palm Springs, Calif., sponsored by Philadelphia Junior Chamber of Commerce.

Apr. 29-May 1—1953 Electronics Components Symposium (AIEE-IRE), Shakespeare Club, Pasadena, Calif.

June 9-11—Second International Aviation Trade Show, Hotel Statler, New York, N. Y.

Sept. 7-13—1953 SBAC Coronation Year Flying Display, Farnborough, Hampshire, England.

PICTURE CREDITS

7—Chase Aircraft; 9—(center left, bottom) McGraw-Hill World News; (center right) Howard Levy; 15—Chance Vought; 17—Ryan Aeronautical Co.; 40—Convair.

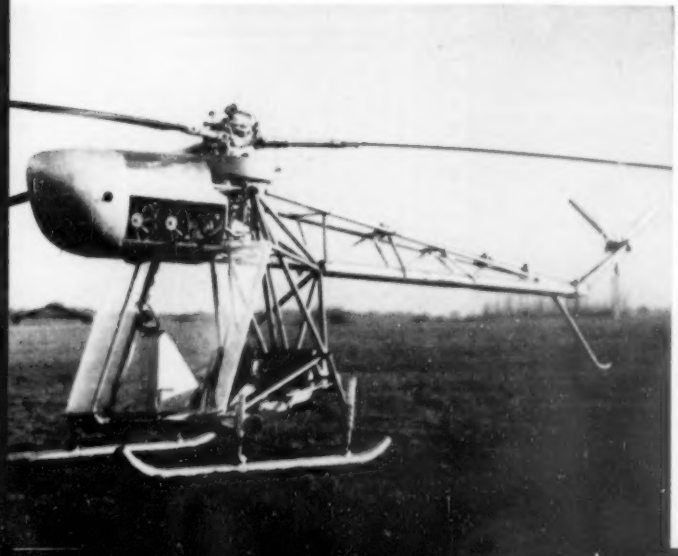
New Foreign Helicopters Show Lines

BRISTOL 173 MK. 1—Twin-tandem-rotor copter (above) is seen on a test flight. It can carry 13 passengers. Later Mk. 3 will be fitted with stub wings.

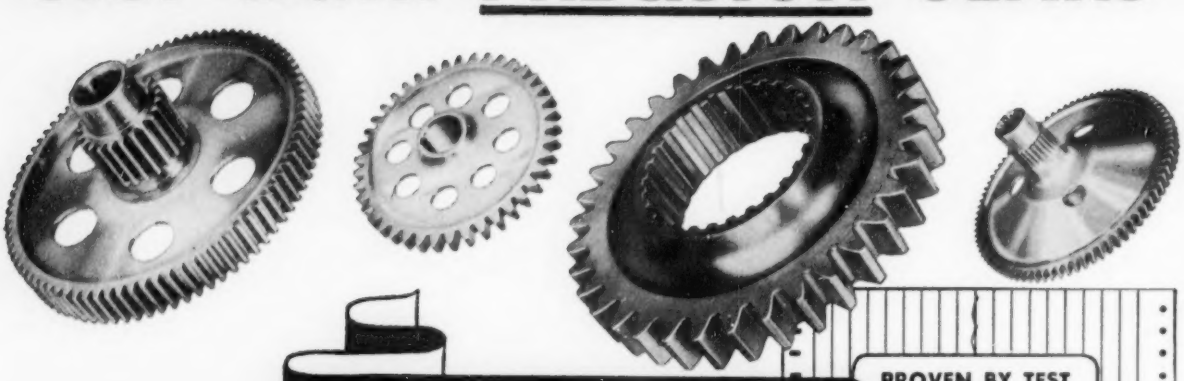
BRISTOL 171 MK. 50—RAAF evacuation copter differs from civil 171 in longer landing gear, hydraulic winch and lower door threshold.

SNCASO DJINN—Single-place S.O. 1220 is powered by a Turbomeca Palouste jet. Empty weight is 550 lb. First flight Jan. 2.

MARTRA-CANTINIEAU M.C. 101—Another new French copter (below, left and right) is a two-seater of unusual configuration. Its Hirth 105-hp. engine is mounted above the cockpit. Empty weight is said to be 880 lb., cruising speed is 60 mph. and endurance 2 hr.



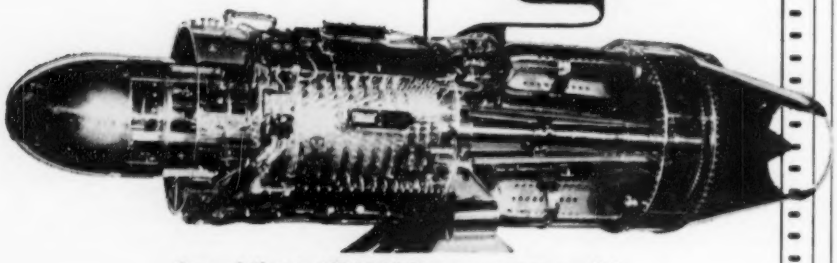
Sier-Bath PRECISION GEARS



PROVEN ACCURACY

PROVEN BY TEST on the latest gear checking equipment. The chart shown here is from a "Red Liner" instrument, which records character, location and magnitude of six different possible errors.

FOR THE AIRCRAFT INDUSTRY



General Electric J47-GE-13 Engine, cut-away model

Martin XB-51 Tactical Bomber — powered by three General Electric J47-GE-13 Engines

North American B-45 "Tornado" Bomber — powered by four General Electric J47-GE-13 Engines

PROVEN BY USE in today's leading aircraft. For example, Sier-Bath gear components are used in General Electric J47-GE-13 Engines . . . which power the two aircraft shown at left, among many others.

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WHO'S WHERE

In the Front Office

Dr. Arthur A. Brown has been appointed vice president of Bowser Technical Refrigeration, Terryville, Conn. He served during 1951-52 as chairman of the NACA subcommittee on icing problems and formerly was a test engineer at Pratt & Whitney Aircraft.

Dwight W. Bloser, former engineer at Sperry Gyroscope and Bendix Aviation Corp., has been named a vice president of Transicoil Corp., New York.

Robert H. Wharton has been appointed assistant to the president of Delta Air Lines.

Changes

Philip V. Mattes, Scranton, Pa., attorney; **Henry A. Satterwhite,** newspaper publisher at Bradford, Pa.; **W. J. Stiteler Jr.,** president of Coal Operators Casualty Co., Greensburg, Pa., and **William R. Waldeisen,** president of Williamsport (Pa.) Narrow Fabrics Co., were elected to the Allegheny Airlines board of directors during a special meeting this month in Washington, D. C.

James B. Edwards, chief engineer of Hiller Helicopter, Palo Alto, Calif., has been elected to the firm's board of directors.

William T. Lake has been appointed controller of Curtiss-Wright Corp., Wood-Ridge, N. J.

C. M. Christie, president of American Latex Products Corp., has been named to the board of Dayton Rubber Co.

William W. Taylor has been promoted to acting general manager of Mooney Aircraft, Inc., Kerrville, Tex.

T. K. Greenlee has been appointed chief electro-mechanical engineer of Lear, Inc., Grand Rapids, Mich.

E. A. Brittenham is new assistant chief engineer of Goodyear Aircraft Corp., Akron, O. Other new appointments include: **C. J. Pennig,** manager Piloted Aircraft Engineering Division; **W. G. E. Mosebach,** manager product engineering; **D. W. Brown,** manager airframe installations design; **R. E. Anthony,** manager of structural design; **P. E. Ziegler,** manager project engineering and preliminary design; **R. L. Ravenscraft,** manager engineering technical service, and **R. C. Hager,** manager piloted aircraft engineering administration. In Goodyear Aviation's business office, **J. L. Gimbel** has been promoted to manager of the Finance Division; **H. F. Hart,** manager of accounting, and **H. K. Hoskinson,** manager of accounts payable department.

Robert S. Putnam has been appointed manager of Solar Aircraft's Industrial Relations Division at the San Diego plant.

J. Wallace Cross is new personnel manager of Doman Helicopters, Inc., Danbury, Conn.

Walton M. Dallas has been named manager of manufacturing control at Temco Aircraft Corp., Dallas, Tex. His assistant is **Robert L. Lewis.**

Farley Vincent, former chief of aircraft fabrication and machining at Kaiser-Frazer.

(Continued on page 80)

INDUSTRY OBSERVER

► **Douglas XF4D Skyray is a supersonic fighter, according to Rear Adm. "Jack" Moss, Deputy Chief of the Navy's Bureau of Aeronautics. Adm. Moss said the XF4D still is under-powered but with "proper" powerplants would easily fly above Mach 1. Skyray first flew with Allison J35, then with the Westinghouse J40-6, a de-rated (7,000-lb.-thrust) version of the J40-8 (13,000 lb. thrust) originally scheduled for the plane. Navy now is considering a shift to another powerplant.**

► McDonnell Aircraft F3H Demon has made more than 100 test flights and logged more than 40 hr. in the air. The Demon also is flying with a de-rated Westinghouse J40 and a shift to the Allison J71 is in prospect for production versions to be built by McDonnell and Temco.

► **Production future of the North American A2J, powered by two Allison T40 turboprops, now appears dim. Navy feels its original pessimism regarding operation of big jet bombers from carriers has been dissipated and the big turboprop-powered bomber planned for the interim will not be necessary.**

► Next round of flight tests on the Douglas A2D turboprop-powered Skyshark probably will determine if present Navy plans for large-scale production of this aircraft will be executed. Skyshark will take to the air with an Allison T40-6, semi-production version of the turboprop engine, in an effort to determine whether earlier "bugs" in the powerplant have been eliminated.

► **Although the last Vought Corsair (F4U) was delivered last month, Navy plans to continue production of the AU ground-support version of the Corsair for some time. Congressional criticism of continued Navy purchase of piston-powered fighters was a factor in changing the Corsair designation to AU for future production.**

► Temco has successfully fired 2.25-in. rockets from its T-35 Buckaroo. Small order for T-35s now on USAF books is actually for Saudi Arabia under MSA program. USAF has no current plans to use the T-35.

► **Evaluation of new 1,000 mc. military navigation system, designed to provide military aircraft with bearing and distance information similar to that obtained from CAA's omnirange and DME, is scheduled to begin as soon as prototype equipments, now under construction, are completed.**

► Canadian sources say that it looks as if the arrangement under which Jacqueline Cochran was to fly an Orenda-powered Canadian-built F-86 Sabre for a try at the world's absolute speed record has been canceled.

► **Anson Johnson, National Airlines' pilot, who won the 1948 Thompson Trophy race at Cleveland in a stripped-down North American P-51 Mustang, is grooming the same plane with additional radiator modifications for further cleanup, in preparation for a world's propeller-plane speed try at near sea level over a sand beach near Miami. Record he is shooting for was set in 1939 by Fritz Wendel, German pilot who flew a Messerschmitt 109R at 469.94 mph.**

► Ultimate solution to the aircraft fastener standardization problem now plaguing the aircraft industry probably will be a single, new-type fastener which will make obsolete all current types. New fastener requirements are currently being drafted by the industry and military but new type of equipment is at least several years away.

► **Beech Aircraft has set up a new expediting committee to push production details of the big USAF T-36A twin-engine pressurized navigation trainer.**

► Watch for Beech Aircraft to come through with the small primary trainer contract, for its T-34 Mentor development of the Bonanza civilian plane. Pentagon reports say a substantial trainer order is all set for Beech.

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ODM Shuffles Aircraft Production Setup

- **New group coordinates all defense output.**
- **Program is designed to keep production high.**

By Alexander McSurely

A new Washington defense production setup designed to handle aircraft and electronics programs more closely coordinated with other defense production programs was being formed last week by the Office of Defense Mobilization.

It re-organized out of existence the Aircraft Production Board and Electronics Production Board, which had been handling production problems for their industries.

New men for the aircraft and electronics industries to date are:

• **John Prendergast,** coordinator of aircraft production.

• **Justin Sypher,** coordinator of electronics production.

They are on a co-equal status with three other coordinators of Atomic Energy Commission, machine tools, and special products and construction programs in the newly organized production division of ODM, headed by James A. Williams, director.

▶ **Policy Group**—Williams also serves as chairman of the Production Executive Committee, policy-making group that includes the Assistant Secretary of Commerce, a representative of the Department of Defense, representatives of the Munitions Board, Air Force, Navy and Army, and additional representatives from federal agencies as needed.

▶ **Industry Representatives**—The committee is also to have as members industry representatives selected by the chairman.

Williams told AVIATION WEEK he expected the industry representation at the policy level would be an important factor in keeping the programs realistic and workable.

Navy Capt. N. W. Rowinski, Air Force Col. Samuel Hale and an Army representative not yet assigned will serve as liaison between the production director and their respective services on day-to-day problems.

While the new setup still is in a formative stage and not crystallized entirely, it obviously reflects the thinking of President Eisenhower's new Administration to curtail and consolidate the emergency controls agencies.

Analysis indicates the Aircraft Production Board has, generally speaking, accomplished the job it was assigned to do and has served its purpose of helping get the aircraft industry geared to the present high output.

Credit for APB accomplishments goes mainly to Harold (Bill) Boyer, first Production Board chief who resigned last May to return to a job as a division manager of General Motors Corp., and to his assistant, Allan Rankin, for staff work under Boyer and subsequent handling of APB programs along the policy lines established by Boyer. Rankin's job was eliminated by the re-organization, and he is taking a vacation.

Indications are that the new coordinator's office will be mainly a status quo preserver, trouble-shooting on short-range production problems until the end of the Controlled Materials Plan June 30.

Williams said his division was being set up to give service to the military agencies, and if they do not think it is worthwhile after a trial period in its new status, "we can fold the whole thing and go home."

▶ **No Aviation Background**—Prendergast told AVIATION WEEK he was a shop and production specialist but not an aircraft man. His principal previous industry experience has been as general superintendent of motor power and equipment for Texas Pacific Railroad, Dallas. He served with the railroad 22 years in various posts. Prendergast came to Washington last June for special defense production assignments, most of which were concerned with the tank program until his present job.

He expects to name four assistants as production specialists in the aircraft field. Their assignments will be:

• **Airframe** including wing, tail, fuselarge, nacelle, surface controls, furnishings and fuel tanks.

• **Powerplant** including engine and accessories; propeller and controls; **fuel** system, except tanks, lubricating and hydraulics systems; ordnance and landing gear.

• **Electrical and electronic system** covering starter system, instruments, communications, electrical system, auxiliary power, anti-icing, engine controls and fire prevention controls.

• **Special assignments.** Prendergast said he wanted specialists with practical shop production experience and that appointments would be announced in a short time.

▶ **Machine-Tool Head**—Col. Louis Kanaar, named coordinator of machine tools for the Production Division, was loaned by the Air Force to the emergency defense organization to work on machine-tool problems and is regarded as an experienced administrator in this field.

Williams said he is holding the production director post temporarily to organize the division and is looking for a man to fill the post when Williams returns to his former job as assistant to Ralph Trigg, Acting Assistant Director, ODM.

ODM's New Production Division . . .

Division director and chairman of Production Executive Committee—**James A. Williams.**

Liaison—**Capt. N. W. Rowinski, Navy; Col. Samuel Hale, Air Force; Army representative.**

Coordinator, aircraft production—**John Prendergast;** four assistants, **V. B. Lee, secretary.**

Coordinator, electronic production—**Justin Sypher.** Assistant: **R. A. Van Valkenberg; A. L. Hickernell, secretary.**

Coordinator, Atomic Energy Commission—**Zera Taylor.**

Coordinator, machine tools—**Col. Louis Kanaar, USAF.**

Coordinator, special products and construction programs—**J. H. Stehman.**

Policy making organization for division is production executive committee. Division director is committee chairman, and members include: Assistant Secretary of Commerce; representative of Department of Defense, designated by Secretary of Defense; representatives of Munitions Board, Navy, Army and Air Force; additional representatives of other government agencies, and representatives of industry as the director may designate.

▶**CMP Status**—Clarifying the new arrangement for the Controlled Materials Plan and "open ending," Williams said all CMP tickets outstanding must be honored before the producers of the three controlled materials—steel, aluminum and cooper—can accept any unrated open-end orders.

Aircraft industry observers speculated, however, that the new arrangement probably will mean aircraft, engine and component manufacturers holding tickets will have to place all their orders for each quarter instead of holding back some for later placement. The hold-back practice has been a cause of frequent conflict between industry and government, since it occasionally resulted in some materials being held up throughout a quarter and not being used.

On the other hand, the aircraft industry practice was based on efforts to keep warehousing and inventory down and to be able to take advantage of price shifts within a quarter.

Williams described the former setup with Aircraft Production Board, Electronic Production Board, and Facilities Review Board as organizations that had many of the same members as the Production Executive Committee. He said the three boards also had duplicating functions. The new organization is "hauling all these boards back under Production Executive Committee," Williams said.

The new Production Division directors said electronics aviation problems would be handled between the electronics and aviation coordinators, that machine-tool problems for aviation would be handled by the machine-tool specialist in coordination with the aircraft coordinator, and that generally there would be less "uncoordinated" independent but duplicating actions hereafter.

▶**After June 30?**—The materials control picture after June 30 still is not clear, except for plans to see that military needs are filled and to take care of some other essential production, Williams said.

What fits into this latter category still is to be spelled out, but this is where the new reshuffle may be of most concern to the aircraft industry. Presumably transport aircraft will continue to get materials on a priority basis when needed, but this has not yet been put down in black and white. Other civilian aircraft, allotted a limited number of CMP tickets, may be forced again to shift for themselves for materials, unless specific new arrangements can be made.

The small civilian aircraft industry previously was awarded materials allotment on a basis of essential business transportation and essential agricultural uses, along with a move to keep a limited production of light aircraft going for off-the-shelf procurement by the armed services. Presumably this reasoning still holds, but industry may have to argue it all over again to make it stick.

C-46 Safety

- **Recertification tests slated for all models.**
- **New CAB regulation cuts plane's weight limits.**

Civil Aeronautics Board will cut the maximum operating weight limit for Curtiss C-46 passenger operation by 700 lb., effective Apr. 1. But CAB's new special safety regulation reduces the load only on planes not yet modified to the "clipped" version of the Hamilton Standard aluminum propeller "or its approved equivalent."

The Board, in issuing this "temporary" special safety regulation, repeats an earlier warning that the plane must be recertificated by Dec. 31, 1953—meeting "in full" the strict takeoff requirements of Part 4B (transport category) of the Civil Air Regulations. The plane currently is certificated under a non-transport regulation.

This means passenger-carrying C-46 operators must put the plane through new flight tests this year. The tests will decide the future payload and range that the Civil Aeronautics Administration will permit for the C-46 next year. Test results will depend upon CAA test methods and upon extent of modification of the C-46 model.

C-46 improvements being developed at American Airmotive, Miami (AVIATION WEEK Jan. 19, p. 80), include trial installation of the 2,400-hp. Pratt & Whitney R2800 CB-16 at a cost of about $85,000 per plane.

Pratt & Whitney told AVIATION WEEK that by the end of this year the company will have plenty of CB-16 engines available for delivery to C-46 and other commercial operators. The main problem for nonsked operators will be financing the capital cost of the C-46 modification. However, some observers see the CB-16 engine's greater power as the answer to long-term safe and economical operation of the C-46.

Without the CB-16 engine, observer estimates of the C-46 recertification weight range from 38,000 to 46,000 lb. The lower figure seriously would limit the C-46 for economic use in common carriage.

▶**Gross-Weight Changes**—The special regulation replaces an emergency rule CAB issued a year ago, cutting all C-46s to a maximum gross of 45,000 lb. for passenger operation. The new regulation temporarily sets a range of 44,300 to 45,300 lb., depending on the plane's model number and propeller type.

The new Board rule starts out by reducing C-46 weight to 44,300 lb. but then allows up to 1,000 lb. more for planes using clipped propellers. The C-46E and F models originally were certificated for gross weight of 48,000 lb., and they use Hamilton Standard aluminum propellers. Trimming the blade ends raises their allowable gross to 45,300 lb. under the new regulation.

The C-46A and D models were certificated for only 45,000 lb., and they have Curtiss steel propellers. To raise their gross from the new 44,300 lb. to a top limit of 45,000 lb. requires conversion to aluminum propellers under the new regulation.

▶**Further Changes**—The CAB order says the extra 1,000-lb. allowance for clipped propellers is "provisional . . . until such time as the (CAA) administrator shall have determined by suitable tests another value to correspond to the additional efficiency obtainable by the use of such propellers. . . ." However, CAA officials indicate informally they plan no such interim changes in the eight months before the Dec. 31 deadline set by CAB for complete recertification.

The Board also states that "our review of the C-46 performance capabilities has led us to the conclusion that there should be no general exemption from (the transport category) requirements, particularly with respect to the takeoff performance requirements at sea level."

The Board concludes: "Therefore, on and after Jan. 1, 1954, the C-46 will be required to comply in full with such takeoff performance requirements, together with such additional standards of the transport category as the Board may decide are necessary to the interest of safety for non-transport category aircraft."

Red Night Fighters Use Airborne Radar

Indications that Communist night fighters are using airborne radar to attack U. S. fighters and bombers are evident in late combat reports from Korea.

First evidence that Red night fighters have a better method of tracking Allied aircraft than advice from ground radar stations and visual aid from searchlights came in a report of Capt. George Kross, a Marine F3D night fighter pilot who was hit by cannon fire from an enemy night fighter after taking violent evasive action.

The Marine pilot initially was in-

formed that an enemy night fighter was closing on him about five miles astern. After taking evasive action at approximately 28,000 ft. for about five minutes, Kross was warned that the enemy plane still was on his tail. Shortly thereafter the Skyknight was hit by cannon fire on one wing.

► **Supersonic Dive**—"Split-essing" away from the enemy plane, Kross put his Skyknight into a dive that eventually built up to an airspeed of about 750 mph. (Mach 1.02) before pulling out at about 8,000 ft. and returning safely to the Marine base. Examination of the Skyknight revealed no structural damage, although the design limitations of the aircraft are strictly subsonic.

Military observers believe the Red night fighter would have been unable to follow the Skyknight's evasive action without having the assistance of airborne radar.

In a wire-service dispatch from Seoul dated Feb. 14, the Far East Air Force confirmed the fact reported in AVIATION WEEK (Feb. 9, p. 13) that Douglas Skyknights flown by Marines had accounted for six Red night fighters. FEAF also announced that Lockheed F-94B night fighters were in action over Korea and had destroyed one enemy night fighter, with claims for four more kills still in the process of evaluation. The F-94-type night fighter has been in Korea for more than a year.

CAB Opens Hearing On Nonsked Crash

Civil Aeronautics Board planned to start preliminary accident investigation hearings last Friday on the mysterious Jan. 7 C-46 crash fatal to all 40 aboard near Fish Haven, Ida., in the Rocky Mountains.

The plane was operated under military charter by Associated Air Transport, Inc., a nonscheduled carrier.

The crew made a routine radio report at 13,000 ft. not far from where it crashed into a 10,000-ft. mountain. The plane was on the proper airway. No emergency broadcast was received before the crash.

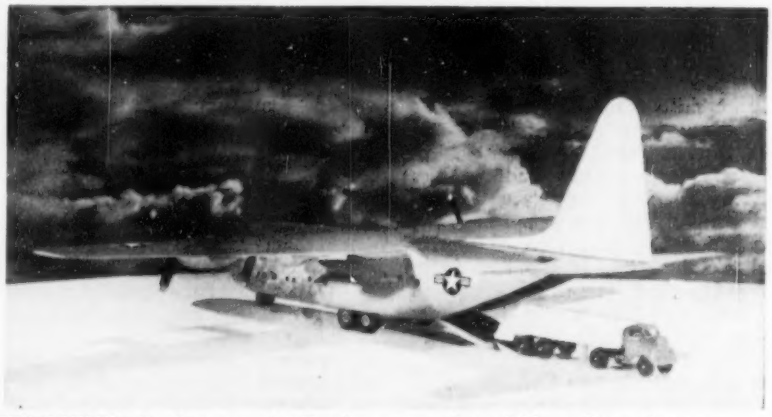
A Civil Air Patrol search plane found the wreckage five days later. Air Force medics parachuted in but found no survivors.

On the next day, two CAB investigators and some Air Force personnel went to the scene. They found that deep snow and ice would prevent further investigation of the crash scene until spring.

This was the first fatal nonsked crash since the series of scheduled and nonsked disasters around New York a little more than a year ago.

CAB will hold supplemental hearings after detailed investigation this spring.

FRONT VIEW of model of Lockheed's new turboprop-powered C-130 transport, and . . .



REAR VIEW, showing upswept tail and rear cargo door which can be used as ramp.

Details of New Turboprop C-130

Lockheed Aircraft Corp. released details this week of its new Air Force C-130 troop and cargo plane, the first U.S. transport designed from initial plans for turboprop engine power.

The C-130 will be powered by four Allison turboprop engines turning Curtiss-Wright three-bladed turboelectric propellers.

The squat, four-engine aircraft will fly faster and higher than any current military cargo plane, Lockheed says, and will be able to make short takeoff and landing runs. Entire fuselage will be pressurized.

► **Details**—Designed by Lockheed to Air Force requirements, the C-130 is a high-wing, low-slung transport with a special tandem-wheel tricycle landing gear that allows operation from small emergency landing fields or unfinished air strips.

Tail section of the transport is upswept sharply, making room for a rear door that is used as an on-the-ground loading ramp or for discharge of cargo and paratroops during flight. A second large cargo door is built in the forward section of the fuselage.

Dimensions of the C-130: wingspan, 132 ft.; fuselage length, 95 ft.; height, 38 ft. Cargo capacity and performance data were not disclosed.

► **Commercial Use**—Lt. Gen. Joseph Smith, commander of the Military Air Transport Service, says the C-130 is a major step toward production of jet transport aircraft in the United States.

The new transport may prove to be a big advance in increasing overall flexibility of the military air cargo fleet, Smith says, and civil operators should find the C-130 a capable freight-passenger carrier.

Prototypes of the C-130 are under construction at Lockheed's Burbank, Calif., factory, and additional production under an Air Force contract will be made at the Marietta, Ga., plant.

First flight date of the new cargo plane is not revealed, but Hall L. Hibbard, Lockheed vice president-engineering, predicts the C-130 will operate more economically than existing military transports and will "perform a variety of air jobs." He says it is a "simple, rugged airplane."

James Douglas Slated As AF Undersecretary

James Henderson Douglas, Jr., 53, a director of American Airlines and former chief of staff of the Air Transport Command, was nominated last week as Undersecretary of the Air Force.

Douglas, a Chicago lawyer, was selected for the Undersecretary post after the Eisenhower Administration decided to withdraw the nomination of Robert Chapman Sprague, Massachusetts electronics manufacturer, because he declined to sell his stock interest in the Sprague Electric Co. (AVIATION WEEK Feb. 16, p. 17).

Henderson won the Distinguished Service Medal for his World War II service as a colonel in ATC. He was an infantry lieutenant in World War I. Born in Cedar Rapids, Iowa, he attended Princeton University, Harvard Law School and Cambridge University in England. He has been associated with Chicago law firms and investment banking houses since 1924 and is currently a member of the law firm of Gardner, Carton & Douglas.

USAF still has vacant one of the two Assistant Secretary posts.

Structural Problem Probed in DC-6 Crash

Investigation was continuing last week to determine if a structural problem was involved in the fatal crash in the Gulf of Mexico of a National Airlines' DC-6. Forty-six passengers and crew died in the Feb. 14 crash.

National's flight, headed for New Orleans from Tampa, had undergone extensive modification to the wing following a CAA directive on DC-6 aircraft modification, an official of CAA's Air Carrier Safety Division reported. All airlines using the DC-6 were ordered last July to rework the forward flange of the wing in the vicinity of the inboard nacelles on both sides.

Two National DC-6s last year experienced considerable skin and spar damage after flying through heavy turbulence. The fatal DC-6 crash occurred during a heavy storm over the Gulf. After National's initial trouble last year, Douglas Aircraft (DC-6 builder) immediately asked airlines to keep close check for skin damage on DC-6 wings until an exhaustive investigation could be made.

CAA, in an airworthiness directive last July, ruled that by Sept. 1, 1953, the airlines must complete reworking of the wing section in the area where National had experienced trouble. Meanwhile, under the CAA directive, airlines were ordered to inspect the forward flange of DC-6, DC-6A and DC-6B wings every 35 hr. on models which had flown 4,000 hr. or more.

Added aluminum alloy reinforcement parts weighing 150 lb. are riveted into the structure to strengthen the forward part of the wing. The area concerned covers about five feet each side of the inboard nacelles.

RAF Offers to Train German Air Force

(McGraw-Hill World News)

London—In a move aimed at closer association with the proposed European Defense Community, Royal Air Force has offered to train most of the West German air force planned under the program, the British Foreign Office has announced.

Under the proposed European Defense Community, the Germans are to be allowed to build up a 1,300-plane air force backed by some 80,000 men. EDC has yet to be ratified by either the French or German parliaments. Until it is, no German forces will be recruited.

The British offer is designed to tie the U. K. closer to the proposed EDC. All shades of political opinion in Britain are opposed to joining EDC outright, despite great pressure from France and from the U. S. The British argue that their military commitments in the commonwealth and colonies make membership in a purely European army impossible. At the same time the British are anxious to be "closely associated" with EDC.

► **Train in U. K.**—The offer to train future German airmen is the biggest step Britain has made yet in the direction of "closer association." German pilots and their crews would attend RAF training schools. German squadrons would train with RAF wings both in the U. K. and with the RAF's 2nd Tactical Air Force in Europe.

The Foreign Office announcement read in part, "Suggestions for assistance include the provision of training facilities, advice on training matters, the secondment (transfer) of British officers to EDC staffs, the provision of tactical demonstrations, and joint unit training exercises."

In essence the British offer extends to Germany the training and other facilities now available to all European NATO members. It is not proposed at this time that Germany become a full member of NATO, just associated with it under the EDC.

NEW LOOK AT THE F7U-3 CUTLASS

Navy's new carrier-based fighter now is designed for power from two Westinghouse J46 jet engines, boosting its speed to at least 700 mph. Study of the above photograph reveals roomy cockpit and what apparently are dive brakes beneath fuselage.

AOPA Blames Airline Pilots in Collisions

Blame for seven inflight collisions between private and carrier aircraft was placed squarely on airline pilots last week in an editorial in the Aircraft Owners and Pilots Assn. monthly pamphlet "AOPA Pilot."

Written by Max Karant, assistant general manager of AOPA, the editorial cited seven "specific, documented cases" in which deaths resulting from inflight collisions between private and commercial aircraft could have been avoided if the airline pilots had been more alert.

"There is no question," the AOPA spokesman wrote, "that the highly skilled professional airline pilots were partially or wholly responsible simply because they weren't watching where they were going. Airline pilots are not using those cockpit windows nearly as much as they should."

Representing AOPA's 40,000 members, he called for reconsideration of "this collision business."

▶ **Wants Proof**—The airlines contend that non-airline aircraft at busy airports are endangering lives because of near misses. AOPA wants proof that each of the crash incidents were wholly the fault of private fliers.

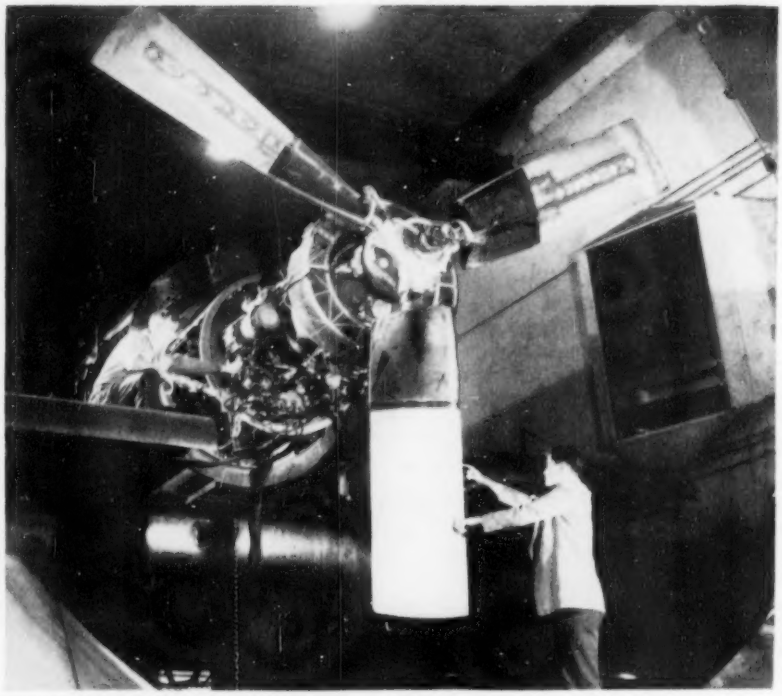
Seven collisions listed in the pamphlet and the aircraft involved:

- **Dec. 24, 1944—near Saline, Mich.** Airline DC-3 and a Taylorcraft. Two private fliers parachuted to safety.
- **Sept. 26, 1945—at Chicago.** Airline DC-3 and a Boeing bi-plane. Two private fliers killed.
- **Jan. 30, 1949—at Port Washington, N. Y.** Airline Constellation and a Cessna 140. Both men in the Cessna killed.
- **Aug. 7, 1949—Milwaukee, Wis.** Airline DC-3 and a Cessna 140. Private pilot killed.
- **Nov. 27, 1951—near Ocala, Fla.** Airline DC-3 and a Piper Cub. Piper pilot killed.
- **June 28, 1952—at Dallas, Tex.** Airline DC-6 and a Temco Swift. Both occupants of the Temco killed.
- **Dec. 15, 1952—at Richmond, Ind.** Airline DC-3 and a Cessna 170. Cessna pilot killed.

"AOPA is aware that the volume of air traffic in large metropolitan areas is increasing," the AOPA editorial says. "As a matter of fact, we think it's a good and healthy thing. That's what the whole aviation industry continues to strive for: ever-increasing use of airplanes for all kinds of transportation. AOPA is also aware of the simple and obvious fact that, if you double the amount of air traffic in a given area, all pilots must be aware of that fact and keep a sharp eye out."

"In view of the fact that the airspace belongs to all who fly, not just the airlines," the editorial continues, "it is obvious that some education—and when necessary—enforcement is needed among the very pilots who say all other aircraft are the ones causing near-misses."

Air Line Pilots Assn. had no comment to make immediately on the AOPA editorial.



NEW WIDE-BLADE H-S prop shown installed on T34 turboprop test stand.

Big New Blade for T34 Engine

The 24-in. wide blades on the new Hamilton Standard propeller designed for use with the 5,700-hp. Pratt & Whitney T34 turboprop engine are the widest ever installed, the manufacturer asserted last week.

The new wide-blade prop is now completing final engineering tests. Similar props already have passed military acceptance ground and flight tests and parts for the new prop are in production. Widest blade previously produced in quantity by Hamilton Standard was 17½ in., although some 20-in. experimental blades have been made.

The new prop will be designed in 12- to 15-ft. diameters, depending on power of the powerplant to be used with it. It will operated at 1,000 rpm., except for takeoff. The T34 is designed for an 11-to-1 ratio of turbine rpm. to propeller rpm.

This is described as the first in a line of new propellers which, with various combinations of blades, can be adapted for engines of more than 9,000 hp. and airplane speeds of more than 500 mph.

▶ **Greater Propulsion**—Erle Martin, Hamilton Standard general manager, says the new propeller on a T34 will give more propulsive thrust for takeoff than any other propeller-engine combination in a similar advanced stage of development. Presumably his statement is directed at the Allison T40 dual-turbine engine and the six-blade contra-rotation Aeroproducts propeller combination, closest competitors powerwise of the United Aircraft turbine-propeller combination.

The new propeller will be installed by Navy on the new Lockheed R7V-2 turboprop Super Constellation transport, scheduled to fly this year.

Blades are of hollow steel, supported internally primarily by a steel core and a vulcanized synthetic sponge filling airspace for support of the outer shell.

The extra blade width is necessary to increase the propeller's capacity to absorb power from the turbine. It is a simpler alternative than installing additional blades in a single rotation or counter-rotating propeller combination, which otherwise might be necessary for the T34's power. However, later propellers in the same line presumably will use more blades in dual rotation to absorb the even higher powers anticipated—up to 9,000 hp.

ATA Studies Copter Transport Potential

Air Transport Assn.'s new helicopter committee conferred last week in Washington with representatives of principal U.S. helicopter manufacturers to lay ground work for detailed study of the rotary-wing aircraft's transport potential for employment on shorthaul intercity routes.

A detailed ATA specification for a transport helicopter will be drawn—specifying configuration, performance, powerplant and rotor system, and control requirements.

Other aircraft phases of the study will include: examination of current designs, appraisal of future designs, evaluation of existing research in the rotary-wing field and recommendations for additional research, assessment of maintenance problems involved, comparison of helicopter and fixed-wing transport maintenance problems, and airworthiness rules which are applicable to the helicopter.

In addition to the aircraft study, the committee will investigate recommendations for navigational aids, flight and operational procedures, crew training, heliport configuration and problems, terminal maintenance and service facilities required, potential markets and traffic, estimates of costs and revenue, and government participation in development of any future helicopter services.

Charles Froesch, Eastern Air Lines vice president for engineering, is temporary chairman of the committee which was selected last month for the study (AVIATION WEEK Jan. 26, p. 20).

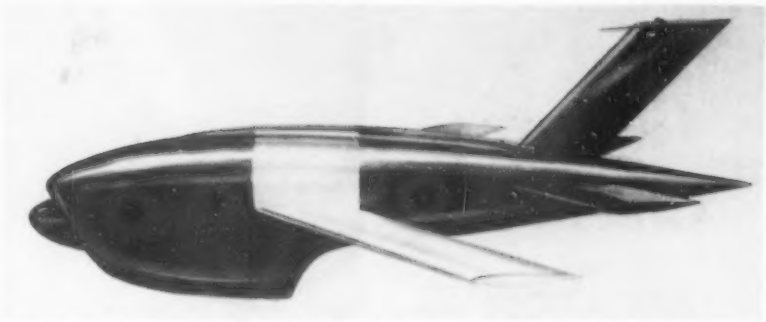
Review of Plane Plant Construction Ordered

Aircraft production facilities currently under construction will be reviewed by the Defense Department before March 2 to determine whether they are projects which should be considered absolutely essential.

Defense Secretary Charles E. Wilson has ordered his three service secretaries to report on the progress of all construction that is not at least 20% completed.

His order followed a request from the Budget Bureau asking the Defense Department to review its operations to cut out, if necessary, any non-essential construction in order to help balance the federal budget.

Reports of the three secretaries will be studied by Defense to determine if any construction of defense industry facilities not 20% completed should be halted.



RYAN'S Q-2 FIREBEE fighter-class drone has been flight-tested with the new . . .

Firebee Engines

- **New Fairchild J44 and Marbore power drone.**
- **Ryan trains officers for operational Q-2 tests.**

The Q-2 Firebee, Ryan Aeronautical Corp.'s fighter-class drone, has been flown with two types of jet engines.

While most of the Firebee flights have been with Fairchild Engine and Airplane Corp.'s J44, the drone also has been flown with the J69 Marbore II, the jet plant developed by Turbomeca in France, with manufacturing rights held in this country by Continental Motors Corp.

▶ **J44 Data**—The J44 engine is designed to embody a high degree of compactness, reliability for frequent reuse in research and training activities after recovery by parachute, and economical production for expendable service.

Its thrust is tagged at 1,000 lb. Total weight is reported as 300 lb. Length is 72 in., diameter 22 in. A simple sheet-metal monocoque structure replaces heavy castings for most of the engine's length. This sheet cowl, reported as a pressure chamber, obviously encloses the compressor section and also serves as a structural frame between the two bearing supports. Fairchild sees unusual production advantages in monocoque makeup for turbojets. Machined parts have been held to a minimum in the J44. The rotor shaft is a light, seamless tube.

▶ **Marbore Data**—The Marbore II is an 880-lb.-thrust jet. It is slightly more than 54 in. long, about 22 in. in diameter. Weight is 275 lb. It, too, could have varied applications in target planes, jet trainers and missiles, as well as a booster for assisted takeoff. This engine is slated to power the Cessna 318 twin-jet trainer.

▶ **Drone Detail**—The highspeed Firebee drone has been under test at Holloman Air Development Center, N. M., in a joint project of the Air Force, Army and Navy, with the AF having technical cognizance of the development. The drone is an all-metal, mid-wing configuration about 18 ft. long and with a span of approximately 12 ft. Wings and tail are sharply swept. Weight is about 1,800 lb. It was designed to offer a highspeed target for training of anti-aircraft, radar-tracking and combat-plane crews.

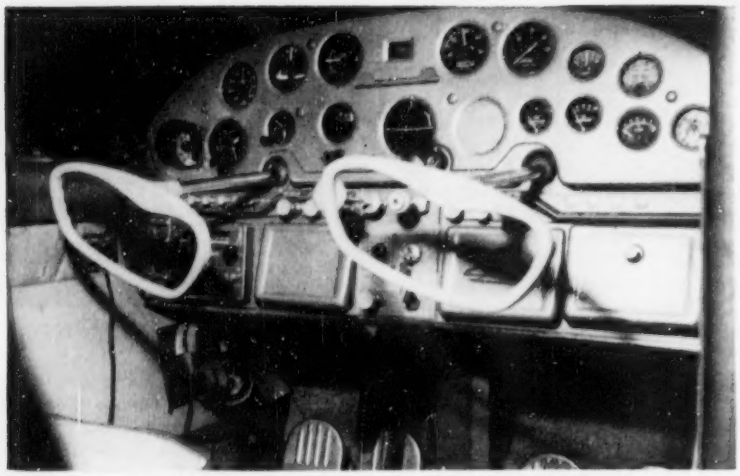
FAIRCHILD J44 (above) and Marbore II.

▶ **Control, Recovery**—The Q-2 is operated from a remote station where command signals are transmitted to the drone by a small control stick and switches to change engine speed and other flight conditions.

The drone embodies a two-stage recovery system (drag chute and main chute) for carrying it intact to the ground. It will lower the drone automatically in the event of a target hit, loss of radio wave carrier from the remote control station, engine failure, or on command by the remote control operator.

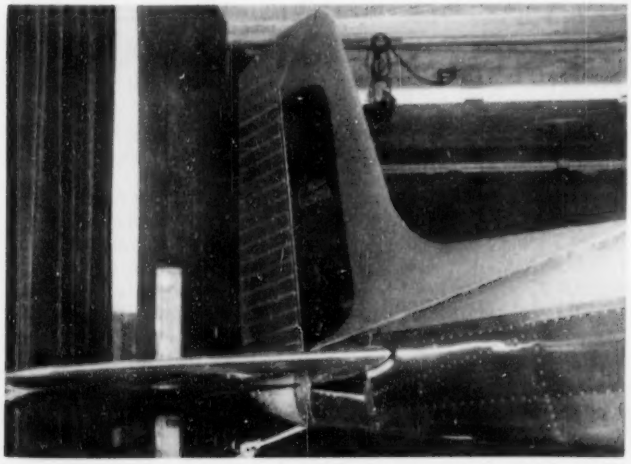
Ryan is now training AF and Army Ordnance officers and technicians in assembly, maintenance and operation of the Q-2s preparatory to operational suitability testing of the drones.

Camera Closeups of New Cessna 180

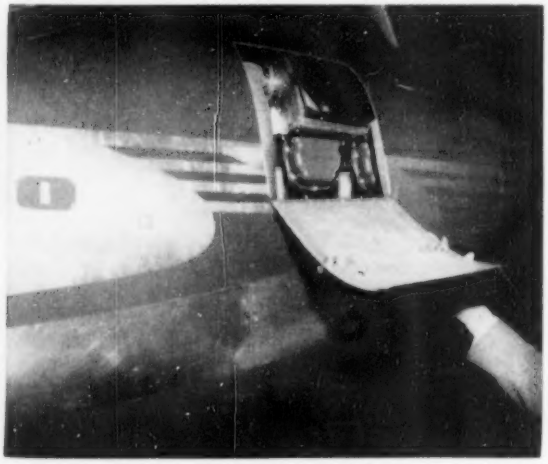


NOSE of 1953 Cessna 180 Businessliner, tipped by a new spinner enclosing prop hub, highlights the attention given to streamlining the overall design to obtain maximum performance. The thin landing struts and well faired wing-to-fuselage struts account for little drag. Inside and out, the 180 also has been laid out for maximum sales appeal. Priced at $12,950, Wichita, its guaranteed cruising speed is 150 mph. Powerplant is the new 225-hp. Continental 0470-A six-cylinder horizontally opposed engine turning a constant-speed Hartzell prop. Fuselage is one foot longer than the lighter Model 170. Cessna reports that its Businessliner total backlog amounts to more than 700 planes having a dollar volume of more than $8 million. This compares with total sales of 1,300 planes last year. Late this month the company plans a mass flyaway of new Model 180s.

CABIN also shows the effort spent on combining practicality with eye appeal. This closeup view details the instrument panel and controls and also provides a small glimpse of the plush interior upholstery.



TAIL closeup of new Cessna, showing the squared-off rudder and the fully movable horizontal stabilizer for aiding trim.



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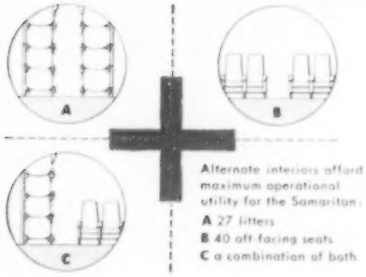

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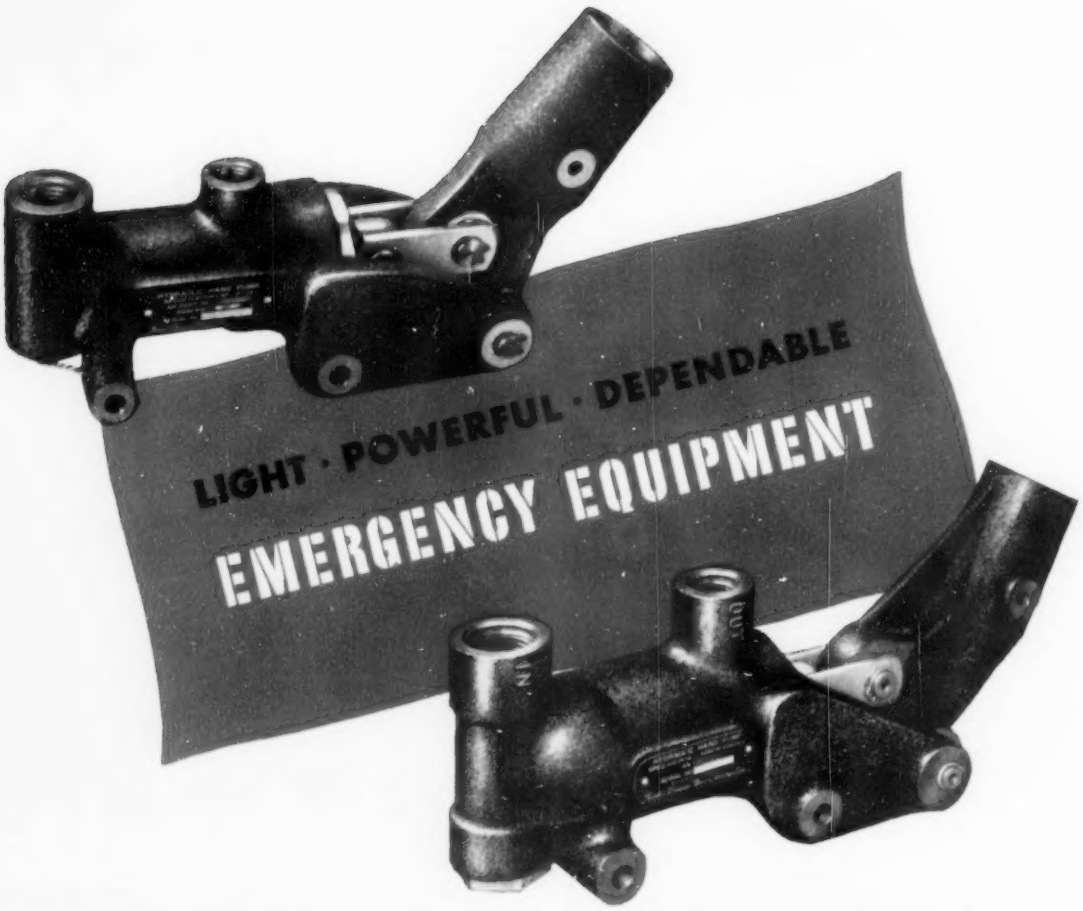

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Hawker Theory Explains Sonic 'Bang'

- **'Boom' builds up from noise of jet aircraft.**
- **Bomb-blast effect can be produced by jets.**

The sonic "boom" or "bang" is taking its place among aeronautical phenomena that have to be reckoned with. Interest in this highspeed-flight noise is more than academic—scientists state that under certain exceptional conditions it may produce the physical effect of a bomb blast. Moreover, complaints are made by residents of areas subjected to bangs.

Several explanations have been advanced for the sonic bang, including the suggestion that it is caused by shock waves built up in front of the plane. The shock wave hypothesis explains that a double bang is the audible evidence of disturbances from first the wing, then the tail plane.

▶ **Shock Waves Discounted**—However, study of the problem, made for Hawker Aircraft, Ltd., indicates that this is not so.

The Hawker company shares general industry interest in the problem, especially because its supersonic Hunter, slated to be a major factor in Mutual Security Agency's offshore buying program, has been responsible for a good share of recent bangs.

According to Hawker analysis, the bang is a buildup or airplane noise—chiefly from the engine—generated when the plane is traveling at Mach 1.0, the speed of sound. Every time Mach 1.0 is passed, whether going through or coming back, a bang is born. There is no limit to the number of bangs that may be generated, the analysis concludes.

▶ **Engine Noise Hypothesis**—A convincing explanation of this "engine noise" hypothesis has been prepared for Hawker by J. W. Fozard. His explanation follows:

"Sound, as is well known, is merely a pressure disturbance of small amplitude transmitted by a wave motion in the fluid through which it moves," Fozard says.

"Let us first consider a point source of noise moving through air at a speed of half that of sound, i.e., at a Mach number of 0.5 (see Fig. 2). If this noise source is considered to be at point A at any given time and points B, C, D, E, etc., are the positions it occupied at say 1, 2, 3, 4, etc., seconds previous to the instant being considered, then the instantaneous noise emitted by the source when it occupied the positions B, C, D, E, etc., has radiated in all directions from each of these positions so that it lies at a distance of (t) x (speed of sound) from its origin, t being the time taken by the source to move this origin to position A.

"It will be seen from the figure that the actual noise precedes its source along the direction in which the source is moving."

▶ **Faster Than Sound**—"Now let us consider the case of the source of noise moving at supersonic speed, say at a Mach number of 2.0," Fozard continues. "Fig. 3 shows the position, at

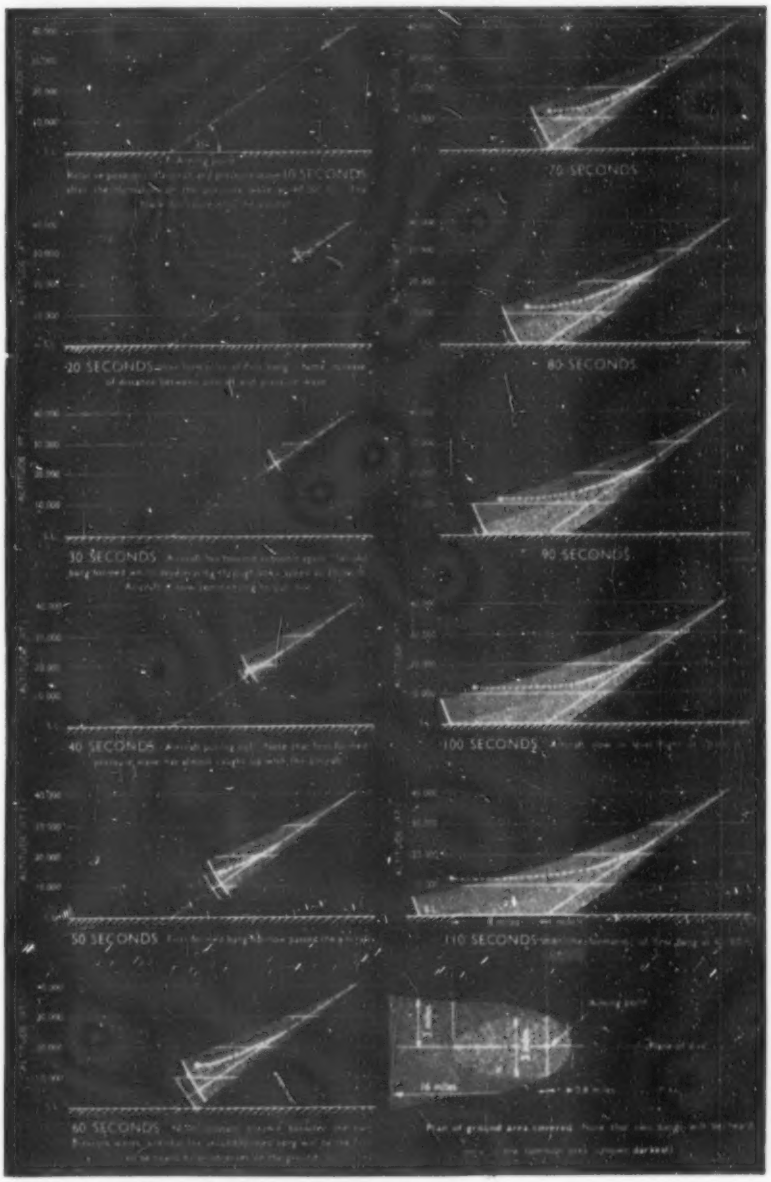

FIG. 1. Time History of a typical two-boom dive, showing pressure wave paths.

the instant when the source is at position A, of the noises emitted when the source was at positions B, C, D, E, etc., these positions being one second apart in time, as in Fig. 2.

"It will be seen that in this case the actual noises emitted by the source lag behind it along the direction of its motion and that enclosing lines can be drawn which are tangential to all the circles. The circles and lines are of course merely sections of spheres and a cone respectively, and this cone is termed the Mach cone. All the noises emitted by a body moving at supersonic speed must lie inside this cone, the angle of the cone being a function of the Mach number.

"It is obvious, then, that at some condition between the two examples quoted above the circles will all intersect at one point. Such a condition occurs when the semi-angle of the Mach cone is 90 degrees, i.e. at a Mach number of 1.0. At this speed the noises emitted by a body will travel with it in its direction of motion, as is demonstrated in Fig. 4.

"Thus the noises emitted by an aircraft in flight at a speed equal to that of sound will remain with the aircraft in the direction of its flight path for as long as it maintains sonic speed, and will continuously reinforce and build up into a pressure field around the aircraft which, as far as the human ear is concerned, assumes the audible characteristics of an explosion."

► **Pilot Unaware**—Fozard says the pilot usually cannot tell he is generating a bang. "The explosive effect of the pressure wave is only apparent to a stationary observer," Fozard's analysis points out.

"As far as the pilot is concerned he is likely to be unaware of its presence whilst actually generating it. Even in the case of a bang which overtakes his aircraft, his speed relative to the wave will be small and thus the rise of pressure with respect to time will be relatively low. This is the mechanism of generation of the sonic bang."

► **Bomb Blast Effect**—"It follows immediately that the intensity of any given bang is a direct function of the time that the aircraft has spent traveling at sonic speed. If it were possible to fly for a prolonged period at a speed equal to that of sound, the bang thus generated would probably assume alarming intensity and might have physical effects somewhat akin to those of bomb blast," Fozard states.

"The argument has been advanced that because of this pressure field which builds up around the aircraft at Mach 1.0, it will be physically impossible to maintain steady flight at this speed. This amounts to the postulation that at a Mach number of unity the forces on the aircraft are

FIG. 2. Position of sound waves emitted by source of noise moving at M = 0.5 at instant when source is at position A, B, C, etc., are spaced one second apart.

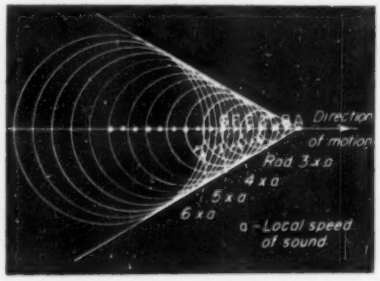

FIG. 3. Position of sound waves emitted by noise source moving at M = 2.0 at instant when source is at position A, B, C, etc., are spaced one second apart.

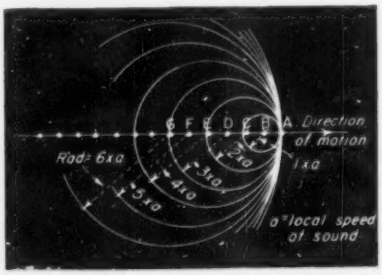

FIG. 4. Position of sound waves emitted by source of noise moving at M = 1.0 at instant when source is at position A, B, C, etc., are spaced one second apart.

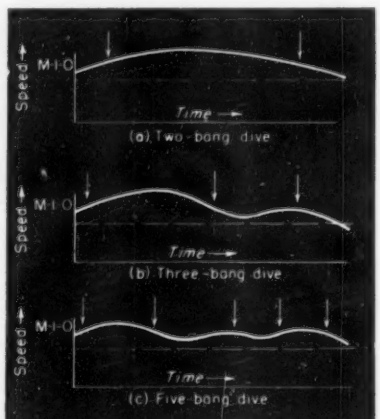

FIG. 5. Possible speed-time histories in sonic "boom" dives.

functions of time. This, however, remains to be proved and will probably remain in doubt until such time as sonic speed is attainable in level flight."

► **Any Number**—There is no theoretical limit to the number of bangs, Fozard says.

"Any number of bangs can be generated in a single dive—ignoring cloud or ground reflections and peculiar atmospheric effects such as focusing—the number being odd or even. Fig. 5 shows a few possible speed-time histories. Fig. 5a is a normal two-bang dive where the speed of the aircraft equals that of sound at two distinct times. Fig. 5b corresponds to a case which would result in three bangs and Fig. 5c is a possible time-history which would generate five bangs.

"The mechanism of propagation of the bangs is somewhat complicated by atmospheric conditions," the writer points out. "Due to the increase of temperature (and hence an increase in the speed of sound) with decrease of altitude, the pressure wave will follow a curved path which is found to approximate very closely to part of a circle.

"Thus, if we consider a bang being generated in the atmosphere, it will initially follow the direction of the path along which the aircraft has been flying whilst the bang was being formed; but, due to atmospheric refraction, it will subsequently curve away such that it tends to become tangential to the ground.

"In other words, the bang will overshoot the pilot's 'aiming point.' During the time that it is traveling earthwards the pressure wave will, of course expand (the semi-angle of expansion of the wave being approximately 8 degrees) and will suffer some atmospheric attenuation. The indications are, however, that the actual degree of attenuation is small over the distances involved.

"We can visualize the whole phenomenon more clearly if we imagine that the wave, during its downward path, is contained within a hornshaped volume, the semi-angle of the horn being about 8 degrees and the curvature of its axis being a function of the altitude and the initial direction of propagation of the wave," Fozard says.

► **No Bang**—Fozard shows why not all flights through Mach 1.0 result in a bang on the ground.

"Fig. 6 shows three possible paths of a bang which is generated at 30,000 ft.," he writes. "It will be noted that the curvature of the path is greatest for shallow angles of dive and that the ground area covered by the pressure wave is elongated in the plane of the aircraft's dive. In one of the cases shown in Fig. 6 the angle of dive is such that the wave will not contact the ground at any point along its path.

"Fig. 1 shows the paths of the pres-

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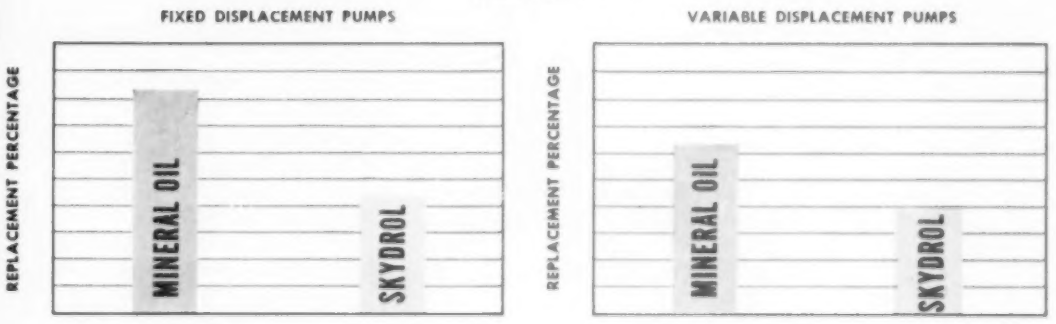
(Over 20-month period)*



Skydrol Reduced Replacement Rate by 49%

Skydrol Reduced Replacement Rate by 41%

*Figures were compiled at the time of overhaul of pumps. Analysis reviewed 345 mineral oil pumps, 884 Skydrol pumps, 343 mineral oil motors and 975 Skydrol motors.

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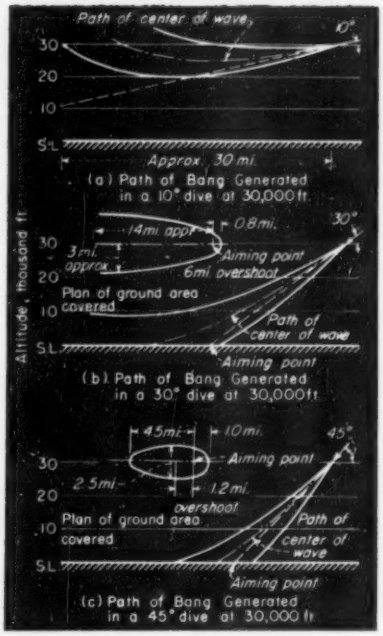


FIG. 6. Diagrams above, calculated for standard atmospheric conditions, show paths of pressure waves produced at 30,000 ft. Wave does not have sharply defined edges, and ground area is badly defined. Dimensions represent only the order of distances involved.

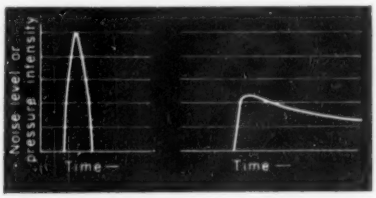


FIG. 7. Comparison of noise history of sonic and supersonic, low-level flypast.

sure waves caused in a 35-degree dive from 40,000 ft. during which the aircraft accelerates through the speed of sound at 40,000 ft. and decelerates through sonic speed at 25,000 ft.

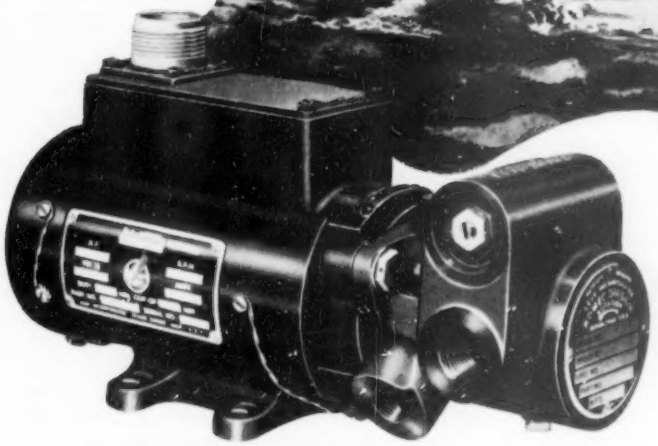
"If we assume that the aircraft travels at a mean Mach number of 1.03 between 40,000 ft. and 25,000 ft., then the time interval between the bangs, as heard on the ground, will be approximately three-quarters of a second–the first bang heard being the one formed at the lower altitude. This occurrence of noises in reverse order–(reverse, that is, with respect to time)–is a fundamental characteristic of supersonic flight.

"If the above dive could be carried out at a mean Mach number of 1.3 then the time separating the bangs would be approximately six seconds," Fozard points out.

"It is of interest to note that on a certain aircraft during a dive similar to the one quoted above, the pilot felt the

Safe-sealed pump aids flight of the

BOEING OFREIGHTER



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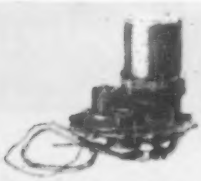
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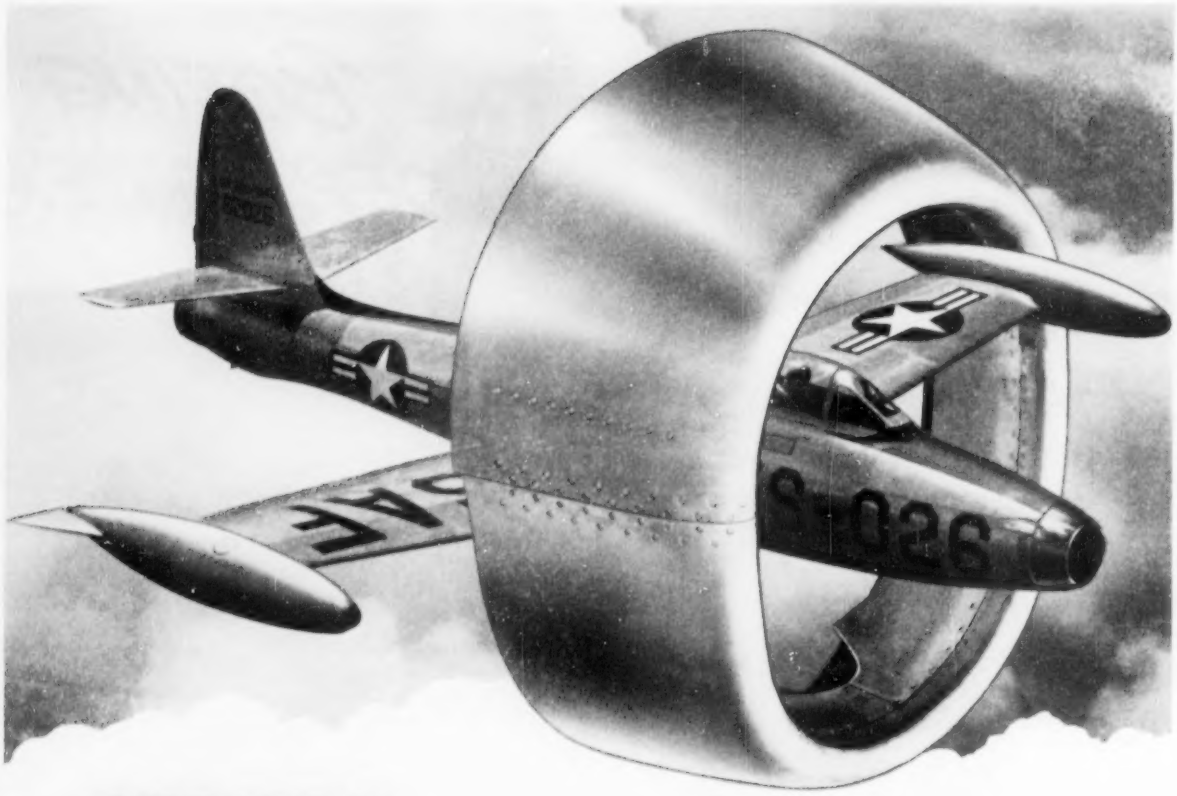

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first-formed bang pass his machine as he became subsonic again whilst still maintaining his original line of dive."

▶**Unfamiliar Effects**—Although Fozard sees little likelihood of bang generation in supersonic flight, except insofar as it will be necessary to accelerate through sonic speed in order to fly in the supersonic regime, he expects unfamiliar effects will be caused by aircraft flying at supersonic speed.

"If we take the case of a very low level run (SBAC Show technique) at supersonic speed," Fozard points out, "an observer will hear nothing during the approach of the aircraft and indeed it will actually pass him whilst still remaining (apparently) silent.

"The first sound the observer will hear will be when the Mach cone passes him. This is likely to manifest itself as a sudden burst of noise, which may or may not come under the classification of a 'bang' and this noise level will be maintained for as long as the observer is within the Mach cone, the only fading being due to normal atmospheric absorption and the effect of increasing distance between the observer and the source of the noise. Fig. 7 shows what the relative noise levels are likely to be if we compare a sonic bang with the probable noises when supersonic flight at low altitude is possible."

▶**Pilot's View**—Hawker's chief test pilot, Squadron Leader Neville Duke, has surpassed the speed of sound some 30 or 40 times, according to his own count. Although there is buffeting and vibration in the range from Mach 0.90 to 0.95, Duke notes nothing newsworthy at supersonic speeds.

"At supersonic speed there is apparently no unusual physical or mental effect upon the pilot and no additional cockpit noise or quiet can be heard," Duke says. "I certainly do not hear any bangs I may make, although a bang made when first becoming supersonic has caught up with the airplane and has been felt later, on slowing down. I remember an occasion, also, when people in another airplane flying nearby felt a bump when it was struck by a bang."

▶**Aiming the Bang**—Duke's flying demonstrations with the Hawker Hunter at last year's SBAC Show included the generation of a number of bangs. Some practice was necessary to make sure the bangs were heard where they were aimed even when the field was obscured by clouds. Here is the procedure that was followed:

On takeoff, Duke was vectored on the Farnborough radar and two fixer stations to a position roughly on the coast south of Dunsfold airport, at an altitude of 40,000-45,000 ft. He was held over the coast at the required height, about 45,000 ft.

When the "proceed" signal was given, a course was set for Dunsfold. Control took over there and homed the Hunter so it came on a due north course until directly over Dunsfold. Then Farnborough gave a quick course to dive on.

▶**Supersonic Test Flights**—Duke sees no reason from dramatic occurrences such as buffeting at Mach 1.0. He says:

"By the time one is flying regularly at or approaching supersonic speed there should not be any dramatic occurrences of this kind. The test program of investigation into high Mach numbers usually consists of a progressive increase in speed in level flight . . .

"Should any effects such as vibration, buffet, change in trim, decrease in control effectiveness or response, or pitching, etc., occur at any time due to Mach number, then very careful examination and analysis of pilot's reports and automatic recording, such as vibrographs, and camera records, is carried out before proceeding further," Neville says.

"Once everything has proved to be satisfactory in level flight, a series of dives at full power and gradually increasing angles would be carried out and the Mach number increased each time by small amounts."

Neville concludes: "A safe maxim

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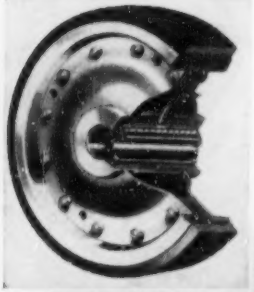

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is to proceed slower and slower the faster one pushes the aircraft, although obviously one must strike a balance between dash and discretion. Only the pilot can decide whether or not to proceed and increase speed further if troubles such as buffet are present, depending on the degree of violence or effect produced."

Spacemen Study Universe Remodeling

The problems of remodeling the universe and of landing on airless planets shared top billing at the recent London meeting of the British Interplanetary Society.

R. A. Smith, a designer at the Government Rocket Propulsion Department at Westcott, spoke on "Landing on Airless Planets," and E. Hope-Jones, a civil engineer, lectured on "Planetary Engineering."

▶ **Improving the Universe**—Hope-Jones considered the possibilities of affecting the motions of the solar system.

(Editor's Note: Hope-Jones was possibly thinking of a proposal made by Dr. Fritz Zwicky of the California Institute of Technology. Zwicky has suggested the realignment of the universe as a possible means of improving living conditions on certain of the planets, including earth.)

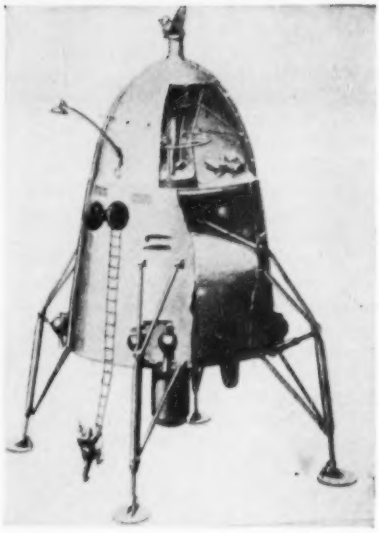
As an example of the forces involved, Hope-Jones said that a cubic mile of rock traveling at 50 miles per second and hitting the moon tangentially would only increase the rate of rotation of the moon by one revolution in 12,000 years.

If this same mass struck vertically, the added velocity would be about three feet per day, and this would have a negligible effect on the orbit. Thus, these suggestions for altering the solar system are no more than pipe dreams, Hope-Jones concluded.

One of the more important tasks of the engineer would be the provision of power on other bodies in our solar system. Nuclear power is not necessarily the answer, said Hope-Jones. Solar power would be readily available on the inner planets and on satellites whose surfaces were not obscured by clouds. Hydraulic and wind power would also be important on other planets.

▶ **Landing Vehicle**—Smith stated that the first space travel would be in a moon vehicle, and that such a spaceship would probably be just the top step of an ordital rocket without wings.

Such a craft would be stressed fairly high—probably to 5G—and therefore would be suited to vertical landing, which appears to be the only practical method of bringing the ship down. Due to the lack of atmosphere, there would be no air damping forces present.



Stabilizing of the vehicle would best be accomplished by means of auxiliary jets, probably three in number, he said.

Stability of the vehicle after landing could be handled by four landing legs, placed as far outboard as possible. These legs would have built-in shock absorbers that would require a stroke of about six feet in order to take a 10G deceleration. The energy absorption of such a landing gear would be equivalent to a drop from 360 ft. onto the moon surface.

Again for reasons of stability, the vehicle should be as short and broad as possible in order to obtain a low position of its center of gravity.

▶ **Landing Approach**—But before you could land you would have to make an approach. The quickest way is the direct radial approach, and under certain circumstances this approach uses the least fuel. But the orbiting technique is not so critical and therefore less dangerous, said Smith.

The spaceship would be put into an arbitrary orbit and its position and velocity would be accurately measured. By doing this, the relative motion and location of the vehicle with respect to the moon could be very accurately calculated, and exact impulses could be applied to bring the ship to rest at a certain altitude above the chosen landing point.

Plane Icing Course At U. of Michigan

The first academic course on airplane icing will be held at the University of Michigan, Ann Arbor, from Mar. 30 to Apr. 3.

The course will feature lectures by 13 experts in the field, including speakers from Canada and France, and will cover the basic phenomena of icing as

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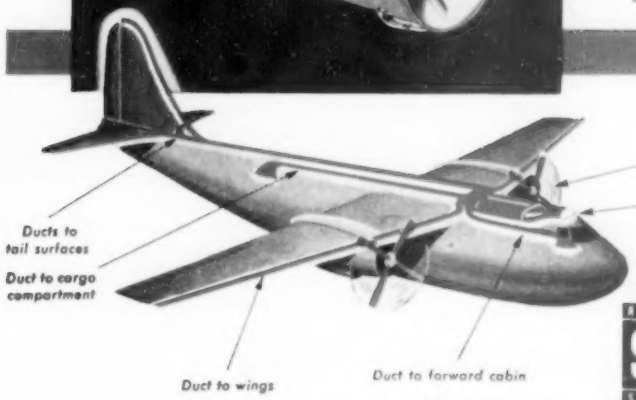
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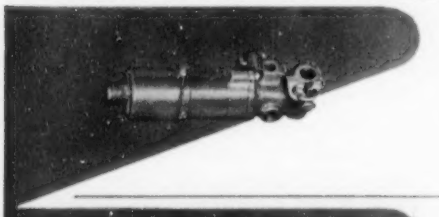

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well as the various de-icing systems now in use or proposed. The course is sponsored by the university's Department of Aeronautical Engineering and the Extension Service, in cooperation with USAF. The university is currently doing icing research for the Air Force.

A design handbook for use in the aviation industry will be issued after the course is concluded. It will contain all the proceedings of the course.

Further information is available from Marland B. Small, Supervisor of Institutes' Extension Service, 4501 Administration Building, University of Michigan, Ann Arbor, Mich.

F2H Parts Tested in New Altitude Chamber

The functional problems of equipment operation under the extreme conditions of today's flight regime will be studied in a new altitude environmental test chamber recently completed at the McDonnell Aircraft Corp., St. Louis. Components of the F2H-3 Banshee, McDonnell's production Navy fighter, have been through the chamber already.

This laboratory unit, which McDonnell says is the largest in the U.S., will simulate altitudes up to 70,000 ft. Temperature range of the chamber is from −100F to 165F. Construction began in the spring of 1951.

▶ **Three in One**—There are three separate chambers in this unit—which McDonnell calls the Altichamber—so that technicians can conduct several tests at the same time. The main chamber is 20 ft. long, 11 ft. wide, and 9 ft. high. It can be merged into a similar chamber only 5 ft. long for tests on larger objects.

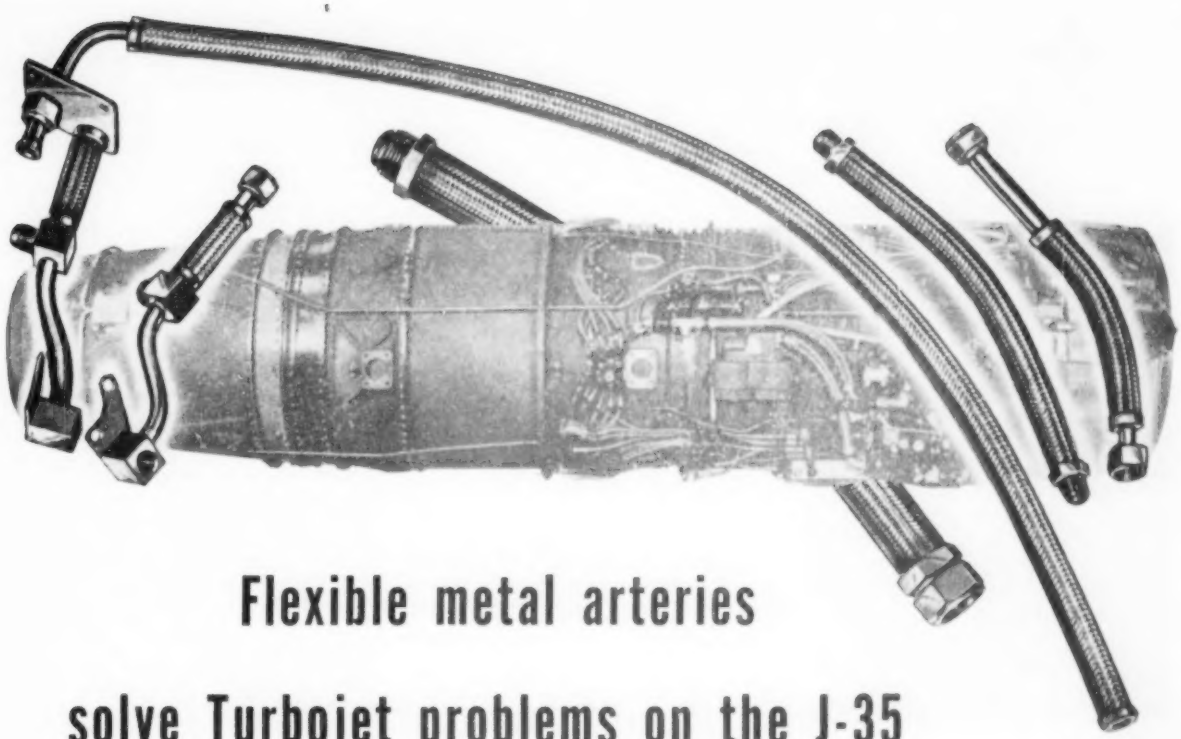
The third chamber is considerably smaller, about the size of an average home freezer unit. This is used as an air lock to the main chamber for personnel, small objects, and tools. It is also available for small tests which could not be run economically in the large unit.

Parts of the Banshee which have been tested in the chamber include the stall-warning stick shaker, the pilot's headrest, valves, instruments and control system bellows.

The entire control system of the Banshee is to be tested at a future date. To accomplish this, an end wall of the chamber will be rolled aside and the entire system brought in.

Remote instrumentation is built into the chamber; remote handling and power sources inside of the chamber are being planned.

Although normally intended for simulated altitude limits of 70,000 ft., strength tests made on the chamber have actually touched the 100,000-ft. mark.



Flexible metal arteries

solve Turbojet problems on the J-35

One of the primary problems in developing the J-35 for production was the development of fuel, oil and air lines to meet today's jet engine requirements. The metal hose had to meet complex configurations of a critical nature and still withstand excessive changes of temperature, high pressures, and unusual vibrations. Other important considerations were close tolerances, ease and speed of installation.

Rigid tubing was unwieldy; configuration couldn't be predicted on the drawing board; mass production was difficult; maintenance costly and complicated.

Because of the intricate nature of the problem, the metal hose lines had to be assembled on mock-up forms. This required flexible-hose engineers, a competent experimental shop, and advanced knowledge of aviation metal hose requirements.

Turbojet designers found the help and the metal hose they needed at Titeflex.

Our long experience with ignition shielding, fuel and oil lines and other aircraft applications enables us to design and construct flexible metal hose and fittings that meet the toughest jet requirements. (In fact, Titeflex was one of the first to qualify in this field!)

Today, Titeflex furnishes a majority of flexible metal hose assemblies for jets. Titeflex research continues to develop new designs of metal hose to take care of the higher temperatures, pressures, and new applications in the jet planes of tomorrow. Our experience and many of our techniques also apply to non-aviation problems. Perhaps yours is one of them. Write us about it today.

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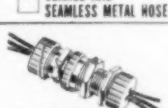

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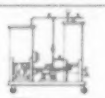

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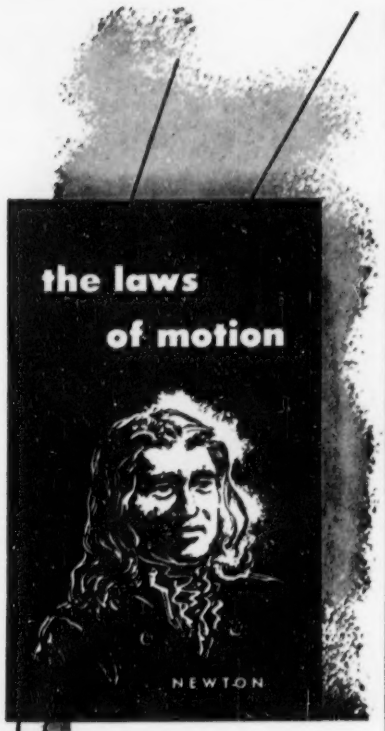

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IAS Summaries

Papers on rocket propulsion and aerodynamics presented at the 21st annual meeting of the Institute of the Aeronautical Sciences are summarized on the following pages.

The summaries continue a series begun three weeks ago on the IAS meeting. Others will be printed in an early issue.

Electronics in Aviation

(Program Arranged in Cooperation with the Institute of Radio Engineers, Institute of Navigation, and Radio Technical Commission for Aeronautics)

▶ **Adaptability of Electronics to Aircraft Engine Control.** Joel D. Peterson and Robert W. Curran, Eclipse-Pioneer Div., Bendix Aviation Corp.

A means of simplifying the task of efficiently operating an aircraft power plant is presented. Although originally developed for use in a "single lever" engine control system, this method utilizes electronic and servo principles that can be adapted to a variety of engine controls for use in single- or multi-engined aircraft. The technique, which eliminates the need for a complicated cable and pulley system, is described in detail and its flexibility demonstrated.

▶ **Systematic Cooling of Air-Borne Electronic Equipment.** Walter Robinson, Research Supervisor, Dept. of Mechanical Engrg., The Ohio State University.

For systematic cooling, electronic units should have coolant flow connections and defined thermal characteristics which correlate surface temperature rise of basic components with coolant flow rate. For least effect on aircraft performance, cooling systems should function with minimum internal temperature gradient. If permissible, flow of the ultimate coolant over electronic component surfaces is thermally most advantageous.

Otherwise, one or more transfer fluids, with or without intermediate refrigeration, may be employed.

In design of closed units for least internal temperature gradient, some cooling methods to be employed at the component surfaces are: forced air or liquid flow, natural liquid convection or liquid spray (with or without boiling), and conduction to external cooling surfaces.

A comparison is made of the physical characteristics and cooling power requirements of units having the same electrical performance but different configurations suitable for application of these methods.

▶ **Omnidirectional Ultra-High-Frequency Antenna Systems for Aircraft.** W. Sichak, Head, Radar and Components Dept., and J. J. Nail and A. G. Kandoian, Federal Telecommunication Labs.

This paper describes an investigation that has been made of various possible solutions to the problem of obtaining omnidirectional coverage from antennas operating in the 1,000-3,000-mc. frequency band on large aircraft. Model pattern measurements were taken on several types of aircraft to determine the limitations of several single antenna sites. No site was found which produced sufficiently good coverage to satisfy the initial requirements (omnidirectional ±3 db. at all azimuth angles and ± 30° in elevation angle).

On a relative performance basis, belly antenna sites located near the center of the wing root gave best performance. The top of the fuselage over the wing root was the second best site, and the top of the vertical stabilizer was the poorest site considered. These conclusions were reached using 1/8- and 1/24-scale models of a DC-3, a 1/16-scale model of a DC-6, and a 1/20-scale model of an XB-51, considering points in space at all azimuth angles and ±30° in elevation of equal importance.

Since a single antenna was not satisfactory, several possible solutions involving dual antennas are considered. The proposed dual antenna system for DME consists of two radiators with complementary coverage, one located on top of the fuselage and the other located on the belly connected to the DME equipment through a switch. One antenna is used as long as the signal is satisfactory. Loss of the received signal switches in the other antenna.

The proposed dual antenna system for Beacon consists of two unidirectional radiators, one located in the nose and one located in the tail, fed in parallel and producing interference off the wingtips. System performance in the interference region is analyzed on a probability basis and found favorable for Beacon.

▶ **What Magnetic Amplifiers Can Do to Increase Aircraft Reliability.** Henry F. McKenney, Asst. Chief Engr. for Airborne Equipment, Ford Instrument Co.

The magnetic amplifier utilizes the magnetic properties of special core materials. Its superiority lies in its ruggedness, reliability, and zero warm-up time.

The future of the magnetic amplifier depends on the development of better core materials, rectifiers, and the ability of engineers to devise new circuitry. We can look forward to the device operating up to the megacycle range, increased use as a computing element, and wider application in the field of servomechanisms.

In summary, the magnetic amplifier operates satisfactorily under vibration and shock conditions; requires no maintenance and no warm-up time; lessens heat-dissipation problems; generally occupies less space and has less weight than an equivalent electronics device; and seldom fails.

Aerodynamics

▶ **Three-Dimensional Laminar Boundary-Layer Flow.** Franklin K. Moore, Lewis Flight Propulsion Lab., NACA.

The possibilities for predicting three-dimensional boundary-layer behavior are inferred from detailed consideration of the case of a cone at angle of attack to a supersonic stream.

Qualitative features of the cone boundary layer are discussed, and solutions are presented.

The notions of displacement thickness and flow separation are generalized to three-dimensional flow. A criterion for wake-type separation is applied to the case of the cone, yielding the maximum angle of attack for which the boundary layer has no cross-flow

wake, for laminar or (more tentatively) turbulent flow.

▶ **Subsonic Compressibility Corrections for Propellers and Helicopter Rotors.** E. V. Laitone, Assoc. Prof. of Mechanical Engrg., and Lawrence Talbot, Asst. Prof. of Mechanical Engrg., University of California at Berkeley.

Through the application of linearized theory, a compressibility correction is obtained which gives the thrust or torque coefficient in subsonic flow for a propeller or a helicopter rotor directly from the incompressible flow values.

The blade element theory is applied to subsonic flow by introducing the linearized compressibility correction, while the first-order compressibility effect on the axial inflow is obtained from the simple momentum theory.

The subsonic compressibility correction for the propeller is found to be expressed in terms of the forward flight Mach number and the Mach number based on the rotational speed of the propeller tip. These relations are directly applicable to a helicopter rotor in vertical flight and reduce to a simpler form depending only upon the rotational Mach number at the rotor tip. It is shown that for the helicopter rotor a satisfactory approximation, for tip Mach numbers less than 0.8, may be obtained by using the simple Prandtl-Glauert correction with the Mach number given by the rotational speed at the ¾ radius. However, at the higher values of the Mach number, this simple approximation underestimates the compressibility effect for potential flow.

The derived compressibility corrections are found to be in excellent agreement with available experimental data.

Aviation Medicine

▶ **Trends and Transition in Acromedical Problems with a View Toward the Next Ten Years.** Brig. Gen. Otis O. Benson, Jr., USAF, School of Aviation Medicine.

The general prediction is made of civil air transport at subsonic speed and altitudes up to approximately 50,000 ft., with military flight to take place at altitudes up to 100,000 ft. and at speeds of 2,000 m.p.h. The air lines will have those human problems that the most advanced military flying evoke today, while the military, in its effort to obtain maximal performance capability, will inherit many critical problems clustered about the consideration of survival versus peak human accomplishment.

▶ **Physiological Aspects of Prolonged Flight at High Altitude and Survival in Emergencies.** Dr. Ulrich C. Luft, USAF School of Aviation Medicine.

Long-distance flights at high altitudes impose increasing demands on aircraft design and equipment, not only to provide tolerable conditions for the occupants in routine operations but also to ensure a maximum of safety in emergencies. Ideal conditions from a physiological point of view would imply constancy of the environment within the aircraft with respect to barometric pressure, gaseous composition, temperature, humidity, and radiation in the cabin.

Precise knowledge of human limitations and the range of biological adaptability permits certain compromises in favor of aircraft design and operational efficiency. In the event of sudden loss of cabin pressure, protective measures must be directed toward reducing the hazards of gas expansion in the body and mitigating the effects of acute lack of oxygen until safe altitudes are reached.

▶ **Atmospheric Characteristics of Greatest Human Significance in Aviation of the Next Decade.** Col. Paul A. Campbell, USAF School of Aviation Medicine.

The frame of reference for this discussion is established by the prediction that the next decade will witness civil passenger travel to altitudes as high as 50,000 ft. and military flight to 100,000 ft. This presentation considers atmospheric phenomena in relation to their biologic implications.

The stratosphere to altitudes of 100,000 ft. presents more serious problems; however, the problems are understood. With the possible exception of heavy primary radiation, all lend themselves to solution.

▶ **Vision at High Speed and High Altitude.** Col. Victor A. Byrnes, USAF School of Aviation Medicine.

There are many factors in the use of the eyes which will require consideration in the next 10 years. Of these factors, the amount and spectral distribution of the light at various altitudes are important from the standpoint of the individual's ability to see and from the standpoint of the well being of his eyes.

A second factor will be the delay in the

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visual perception mechanism of the human being. This delay is relatively insignificant under ordinary circumstances, but under multi-Mach speeds, it can be extremely important.

▶ **The Problem of Noise in Air Transport and in Ground Operation.** Lt. Col. James E. Lett, USAF School of Aviation Medicine.

Jet noise shows a spectrum quite different from the conventional aircraft noise. Called "white noise," its total energy content is greater than the spectrum indicates. More high-frequency components in the jet noise increase the potential for damage to the ear but render shielding within the aircraft more effective. The principal problem concerns ground personnel.

In addition to "acoustic trauma" to the ear, noise has other and more general effects. Maintenance effectiveness can fall off in noisy environments. Workers will be helped by wearing protective devices and having repeated hearing checks and regulated exposure-rest cycles. Changes in design, location, and operating procedures will protect other people involved.

▶ **Aeromedical Problems for Nuclear-Propelled Aircraft.** Lt. Col. John E. Pickering, USAF School of Aviation Medicine.

Feasibility of peacetime uses for atomic power has been argued for several years. If one accepts the military need to fly half way around the world and return nonstop, utilization of nuclear fuel becomes realistic. Nuclear propulsion for aircraft presents many engineering and design problems. However, careful evaluation also reveals a series of medical problems resulting from the power plant or, more specifically, from the nuclear radiations associated with the operations of the power plant.

These problems and many others have initiated a widespread biological research program associated with nuclear propulsion.

▶ **Crash Protection in Air Transports.** Lt. Col. John P. Stapp, Aero Medical Lab., WADC.

Tolerance and survival limits to crash-type forces have been explored by exposing subjects to controlled linear decelerations in various positions and ranges.

The rate of change of deceleration in G per sec. (third derivative of motion slope) relates significantly to tolerance and survival above 30G peak deceleration. Total area of restraints, elasticity of webbing, areas of load application on body, and stability of configuration of protective harness determine degree of protection for all but rear-facing positions. Application of deceleration research to air transport passenger and crew protection is discussed. A safety net for rear-facing seats is described.

▶ **Impact of Modern Aviation on Health.** Lt. Col. Harold V. Ellingson, USAF School of Aviation Medicine.

Modern developments in air transportation have two opposing effects on world health. On one hand, increasing speeds of travel and expanding networks of air lines tend to increase certain health hazards. Air travel may facilitate the spread of communicable diseases and harmful insects. New occupational health hazards are being encountered.

On the other hand, air transportation is

stimulating the improvement of health. Communities on international air routes are establishing control over certain diseases in order to facilitate air travel. Air transportation extends the services of great medical centers into remote areas.

Motorless Flight

► **Flight Observations of Suction Stabilized Boundary Layers.** Bruce H. Carmichael, Aerophysics Dept., Mississippi State College.

A method of distributed suction through a perforated skin is described, and studies of optimum distribution of porosity and limits of internal wing pressure for complete boundary-layer stabilization are presented. Some aspects of the economy of this distributed suction method on aircraft cruising speeds are given, as well as the influence on other performance parameters.

Detailed observations of the nature of the boundary layer stabilized by suction under adverse pressure gradients are presented along with a description of the instrumentation employed. Some practical suggestions are offered on construction methods and structural features compatible with this system.

► **Structural Comparison of Perforated Skin Surfaces with Other Means of Effecting Boundary-Layer Control by Suction.** Charles B. Cliett, Aerophysics Dept., Mississippi State College.

The results of a series of studies to determine the structural feasibility of perforated sheet materials, which could be used as a means of effecting boundary-layer control by suction, are presented. These results include the ultimate tensile and shear strengths of some perforated plywoods, and of perforated 24ST-3 aluminum-alloy sheet, and the flexure-fatigue strength of this perforated aluminum-alloy sheet.

Transport Safety

(In Cooperation with The Daniel and Florence Guggenheim Aviation Safety Center at Cornell University)

► **Aircraft Approach Tolerances—Pilot Problems in the Last 3 Minutes of a Successful All-Weather Approach and Landing.** Arthur Jenks, Chief, Flight Inspection Div., Federal Airways, CAA.

The industry is still confronted with occasional missed approaches at current minima and a reluctance to fly lower weather or "all-weather" without complete assurance of approach success.

Present-day approaches are based on "straight-in" procedures, and the electronic aids are designed and tailored to this requirement. Straightline flight, particularly adherence to a predetermined straight-line path, is one of the most difficult of flight maneuvers, especially under instrument conditions. A variety of complexities can disturb the aircraft from its desired path, necessitating small corrective turns to restore the desired track. The forces in these turns are minute. The aircraft, particularly in the higher wing loadings, follows for an appreciable distance a ballistic path rather than the aerodynamic path. The inability of the pilot to recognize (with present instrumentation) and allow for this turn/time lag tends to induce overcorrection and the resulting development of an oscillatory flight path.

FOR JET ENGINES
MASS PRODUCED with the aid of...

microcast®

Turbine-type jet engine units develop "push" with the aid of hundreds of tiny power blades and buckets. These parts are made of high-temperature alloys by the Microcast Process. This mass production technique solves the problem of handling the hard, virtually non-machineable alloys required for jet power plants at substantial savings. This flexibility and economy in producing high-heat alloy parts can be put to work for you. Let us show you how precision cast parts can fit into your product's design. Write for 16-page booklet and information on the new MICROCAST color movie.

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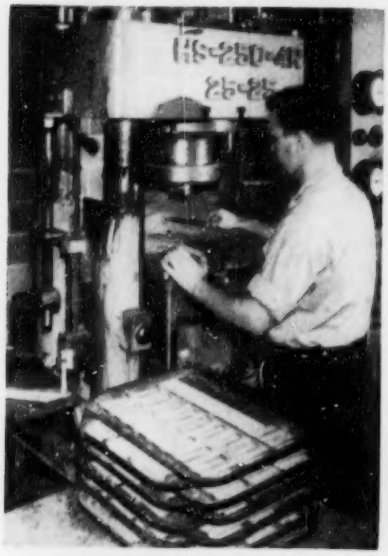
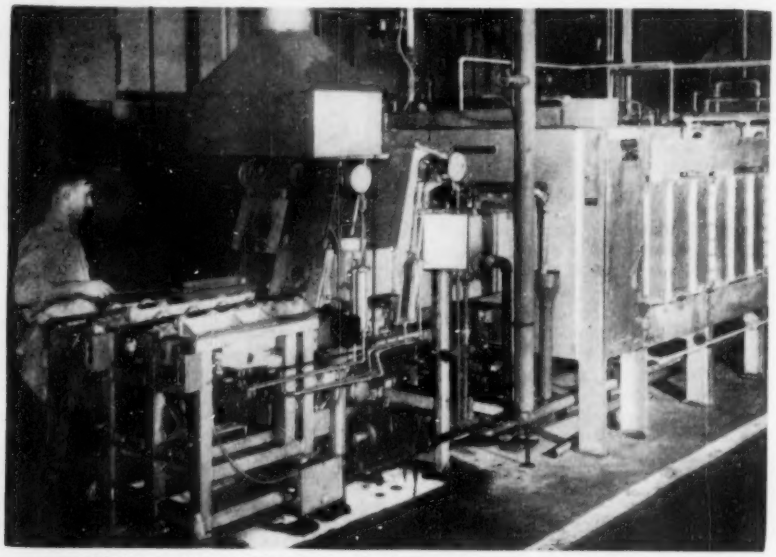
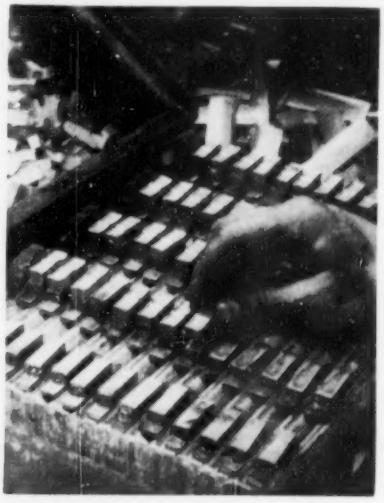




1. MOLDING and sintering jet compressor blades made of Thompson Product's new cermet material in a powder process similar to the metallurgy method, illustrated in this picture series.

2. COINING further compresses the blades in a hydraulic press, giving them additional strength after sintering and adding twist and contour.



3. COPPER infiltrant pellets are placed on blade roots.

Cermets May Help Jets Operate Hotter

Cleveland—A new cermet (ceramic-metal) material being developed here at Thompson Products' Tapco plant promises to be a highly useful material in the design and operation of jet engines.

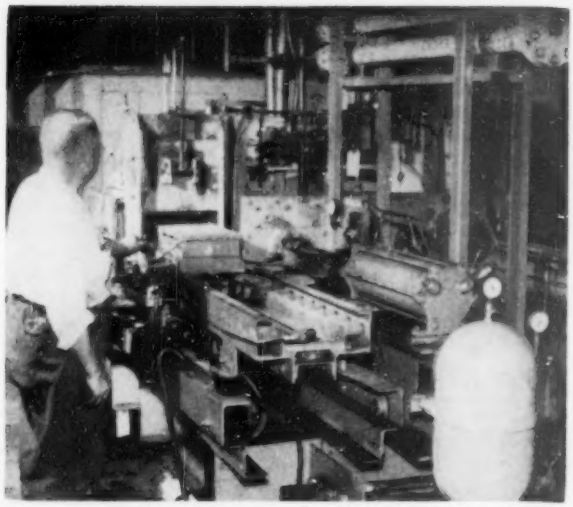
Should development work on this titanium carbide-metal project prove successful, engine combustion temperatures 200-300 deg. hotter than those permissible with alloys now in use may be attained. This temperature increase would promote greater engine efficiency.

▶ **More Ductile**—The particular application of the new material would be in properly matching turbine buckets and wheels—a feat impossible with previous cermets because of their low ductility. The new cermet has a ductility approximating that of metallic alloys and is superior to them at operating temperatures in the 1,000-to-2,000F range.

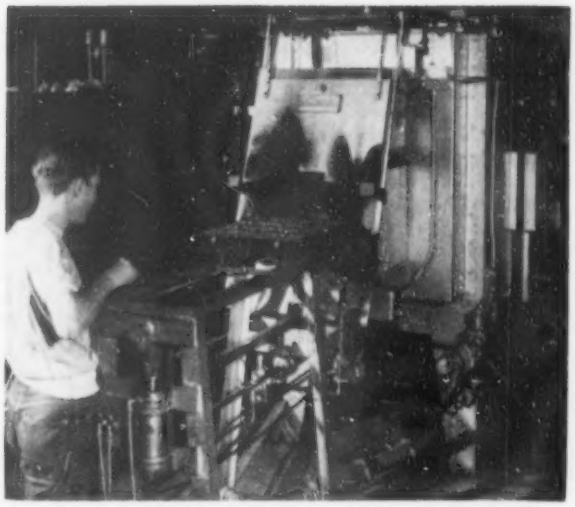
Uniform section samples taken by Thompson experts are reported to "show excellent physical properties superior to any intermetallic of our knowledge."

The new ceramic has a hardness almost equal to that of glass—about 90 Rockwell A or 600 Brinell—yet it can easily be bent through a 20-deg. arc. If the radius is generous enough, a 90-deg. bend is possible.

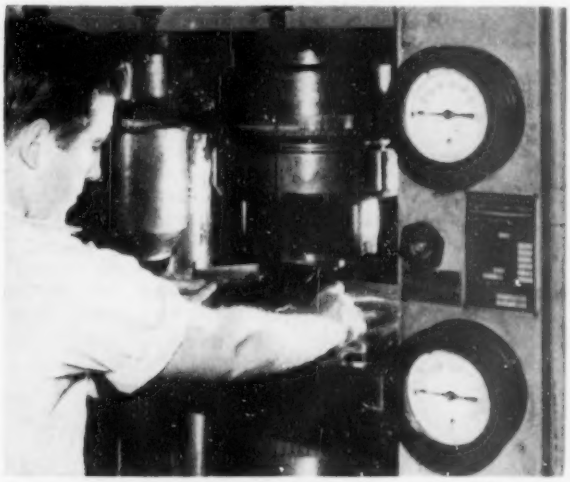
▶ **Shatter-Resistant**—One big advantage claimed for the new cermet buckets is



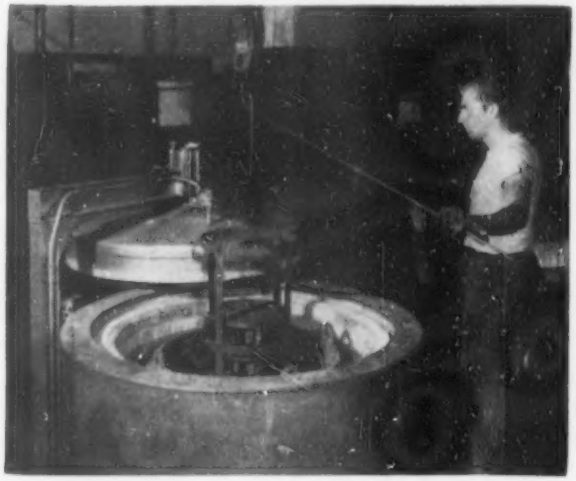
4. INFILTRATION melts copper alloy at 1,980F, giving blades 100% density.



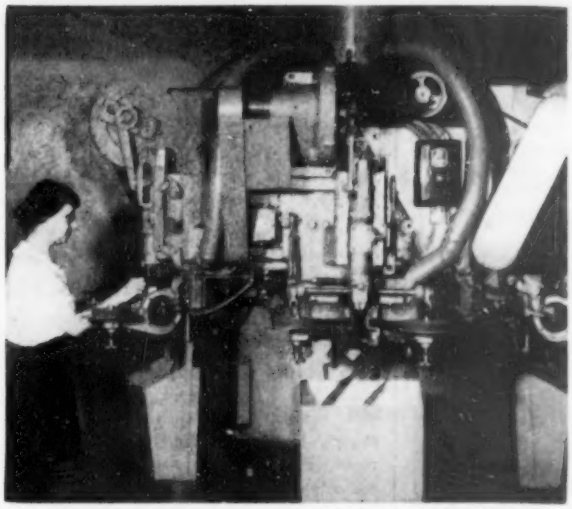
5. SOLUTION heat treatment in an oil quench is made for additional blade strength.



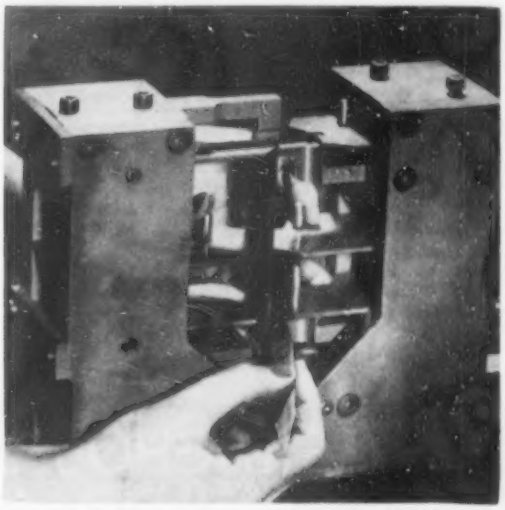
6. STRAIGHTENING restores twist and contour to heat-warped blades.



7. PRECIPITATION hardening at low temperature provides final strength.



8. MICROPOLISH puts perfect plating surface on the jet compressor blade.



9. INSPECTION of blade is made on a guillotine gage and by X-Ray.

protection for jet engines against damage incurred by ingestion of foreign matter. Previous brittle cermet buckets broke under strains caused by the nicks and scratches received in this manner but the titanium carbide compound is said to have overcome successfully this difficulty.

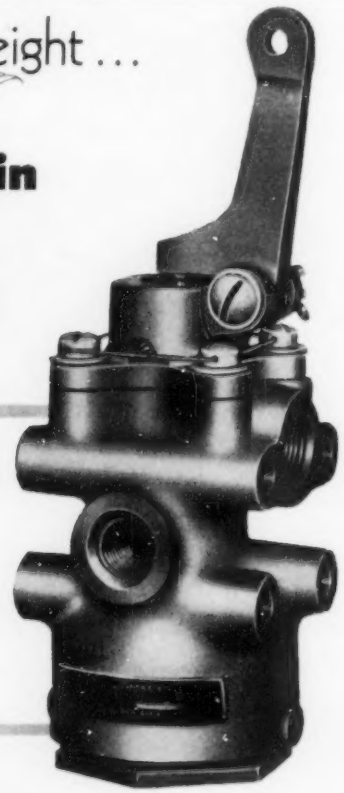
In tests undertaken by Thompson, small-arms (.22- and .32-cal.) fire usually ricocheted off to the sides and failed to damage sample pieces.

A powder process similar to the powder metallurgy method is employed in manufacture of the titanium carbide shapes. The powder is compacted, sintered and then infused with a metal not identified by Thompson officials. The pictures on these pages show how Thompson has been making powdered-metal rotor and stator blades. Last released figures for this high-production method gave a monthly output of 250,000 blades (AVIATION WEEK Sept. 17, 1951, p. 30).

The price of buckets made by the new process will be comparable to those now in production, say company spokesmen, when the new type attains full production. In its early stage the new process may be available at an increase of 25% over present types.—GLC

So little in weight...

so big in BRAKING SAFETY!



Westinghouse AP-1 Brake Valve

Operating pressure: 3000 psi

Proof pressure: 4500 psi

Burst pressure: 7500 psi

Weight: 1 lb.

Just a pound of prevention is worth untold savings in safer operation and protection of aircraft equipment. The Westinghouse AP-1 Brake Valve—weighing no more than a pound—assures control of any degree of braking pressure in conformance with runway conditions.

The Westinghouse AP-1 Brake Valve permits application of a regulated pressure . . . as compared with dumping full braking pressure by other means. Used as an emergency brake, it minimizes the hazards of overbraking with the attendant risks of tire skid, ground looping, and tire blow-out.

This brake valve possesses a maintaining feature whereby the degree of pressure is *automatically* maintained against overcharge or pressure drop in the braking system.

AIRCRAFT SECTION
WESTINGHOUSE
AIR BRAKE COMPANY
WILMERDING, PENNA.
INDUSTRIAL PRODUCTS DIVISION

Stainless Tube Made With Glass Lubricant

An extrusion process using glass as the lubrication medium has been demonstrated to a group of government officials. Seventy-five members of the National Production Authority, Defense Production Authority, Munitions Board and the Armed Forces witnessed a stainless steel tubing extrusion demonstration on a 2,500-ton Loewy Hydropress operated under the French Ugine Sejournet glass lubrication method. Extruded lengths of 30-60 ft. were run off.

The show was held at Babcock & Wilcox Tubular Products Division, Beaver Falls, Pa., and was sponsored by Loewy Construction Co., Inc.

Slant Tool Setup Saves Floor Space

More floor space has been salvaged at Rohr Aircraft Corp.'s Chula Vista, Calif., plant by setting a battery of drop-hammers at a 45-deg. angle to the aisle.

Rohr finds the arrangement gives about 50% more usable floor area. The slant setup permits room for a loader to handle dies and punches, where formerly an overhead crane had to do the job.

Complementing the angle scheme, racks on top of hammers now accommodate spare trip-ropes. Formerly these racks took up floor space adjacent to the hammers.

DIALING NUMBERS

Dial painting of B-16 type compasses has been speeded and simplified at Temco Aircraft Corp.'s Grenville, Tex., overhaul division with this company-devised conical stencil. Hollow-cone unit fits over dial face mounted on a swivel base. Stencil and dial are rotated by knurled knob at apex while paint is sprayed on with gun. Procedure is accurate, eliminates tedious hand-painting.

Radio Speeds Douglas Operations

Radio is speeding heavy hauling jobs at Douglas Aircraft Co.'s El Segundo Division. Two-way, low-power radio units which have been used for alerting personnel for the movement of heavy dies between storage area and drop-hammer site have proved so effective that the company is expanding their application.

In the die-hauling operation, drop-hammer phones a dispatcher who radios the request to the carloader operator. Loader is moved to the drophammer, picks up the old die for return to the 5-acre storage area, then carries the new unit back to the hammer site. This eliminates the need to send anyone from the dispatcher or the hammer site to the die yard.

Douglas is equipping 30 carloaders with radio for operations of all types over the entire 381 acres of the plant.

Two-way radios are also being considered as equipment for such conveyances as the company's highway trucks and courier cars to make contacts possible within a radius of 50 mi.

Eutectic Contest

Rules have been announced for Eutectic Welding Alloys Corp.'s $2,000 prize competition for "Contributions to the Science and Art of 'Non-Fusion' Welding, Brazing and Soldering" and may be obtained by writing to the company's Dept. P, 172nd St. Northern Blvd., Flushing 58, New York, N. Y.

Contest is open to engineers, metallurgists, research investigators, welders, students, faculty members and "all others qualified." The deadline for entries is Aug. 31.

PRODUCTION BRIEFING

▶ **Cawley Aircraft Supply Co., Inc.,** Whitestone, N. Y., has entered the AN hydraulic-fitting field as manufacturers and will produce to stock and special orders. Formerly the company acted as distributor for manufacturers of hydraulic fittings but has discontinued this phase to enter the production end.

▶ **Aeroquip Corp.,** Jackson, Mich., has granted Super Oil Seals & Gaskets, Birmingham, England, a license to make and sell Aeroquip hose, fittings and flexible-hose assemblies in Great Britain, Australia, New Zealand and South Africa—including use of Aeroquip patents, name and trademarks.

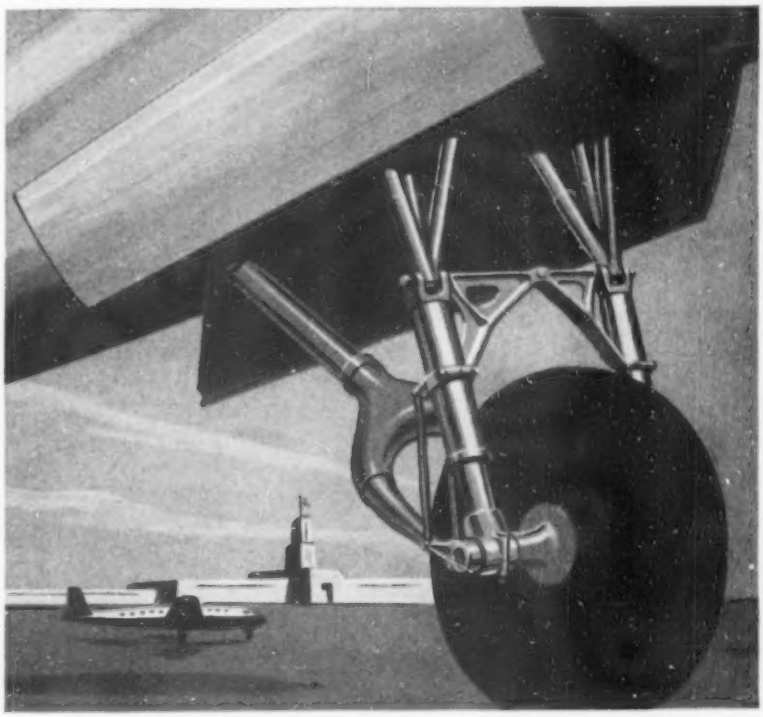
▶ **Aluminum Distributors, Inc.,** Chicago, has been appointed distributor of Reynolds Metals Co. products and is equipped to handle less-than-carload lots in various categories.

▶ **Manning, Maxwell & Moore, Inc.,** has formed a separate division to design, develop and produce aircraft instruments. The firm has been handling aircraft instrumentation since 1940. Location of the new division is at Stratford, Conn.

▶ **Pratt & Whitney Aircraft Division,** East Hartford, Conn., almost has doubled employment and production space since mid-1950 and expects to add 5,000 more employes during the next few months. Approximately 50% of the horsepower delivered by P&WA in 1953 will be jet, according to general manager William P. Gwinn.

▶ **Hydro-Aire, Inc.,** which recently opened a new main plant and general offices at 3000 Winona Ave., Burbank, Calif., has expanded into the turbomachinery field.

▶ **Resdel Engineering Corp.,** Los Angeles, is producing a new dielectric heater for use in aviation plastics. The corporation's Industrial Division recently was expanded for manufacture of both dielectric and induction heating gear.



Sturdy Tubing for Landing Gear

When aircraft designers come to a problem where dependability and strength are a requirement they turn to steel tubing. From the planes of yesteryear to today's modern aircraft the increasing demand is for steel tube for the heavy responsibilities of landing gear, engine mounts and all other points of stress. When your requirements call for steel tubing, look to Service Steel for a dependable source of supply. Whether large or small, from warehouse or mill—your orders are always shipped on schedule. For a complete list of our aircraft tube stock write, wire or phone us.

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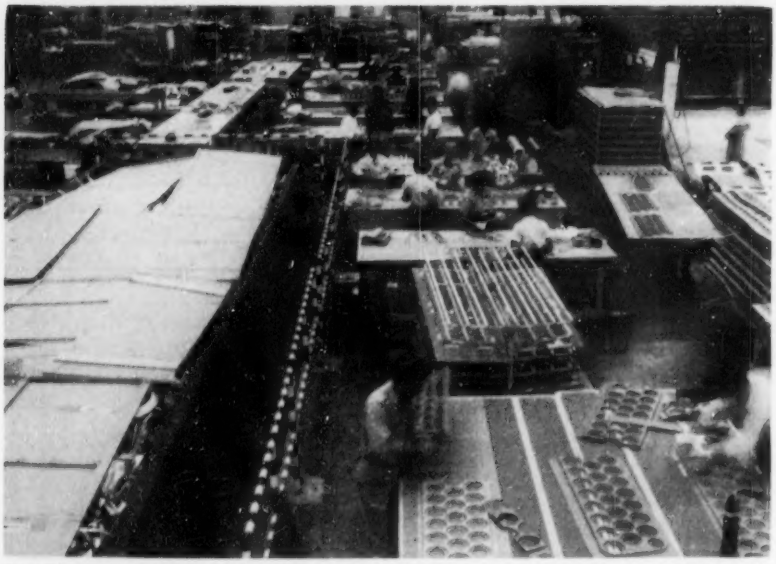
DETROIT 7, MICH.

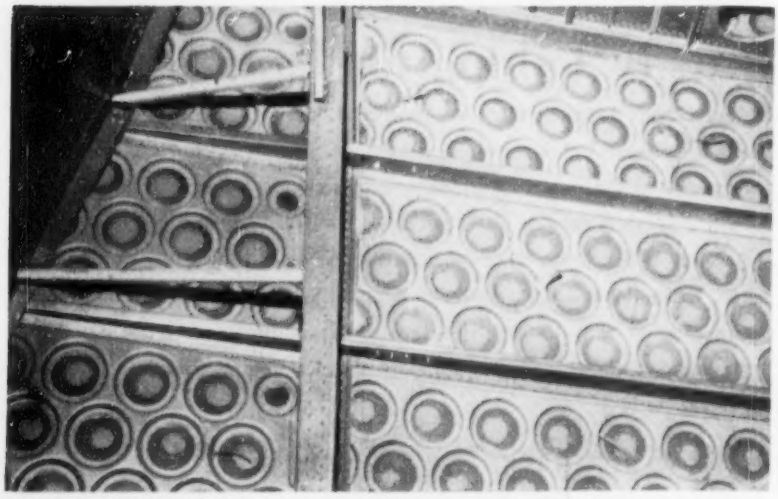
2440 HUNTER STREET
LOS ANGELES, CALIF.

METLBOND PROCESS was used in 5,600 sq. ft. of skin assemblies to cover 28% of B-36 external surface.

Convair Pushes Metal Adhesive Studies



PRODUCTION LINE at Convair's Fort Worth Division where metal portions of B-36 skin are joined with cement and special adhesive tape.



WAFFLE CONSTRUCTION shown in B-36 wing trailing edge interior.

- **Program investigates use of Metlbond and FM-45.**
- **Supersonic temperature problems to be checked.**

Production refinements and extension of use of metal adhesives are the purpose of studies being pushed at Consolidated Vultee Aircraft Corp.'s Fort Worth Division under Air Force contract.

Two types of adhesives are being used in this development program:

• **Metlbond film,** a tough Convair-developed adhesive containing rubber, was selected because of the large amount of data Convair has garnered through its use in B-36 production.

• **FM-45** resin-type adhesive, a product of Bloomingdale Rubber Co., Chester, Pa.

Under the program, materials to be bonded will be limited primarily to clad aluminum alloy, since that has been used in the past as the standard for testing. Data also will be accumulated on use with magnesium alloys.

▶ **Other Considerations**–The investigation may be extended to cover problems involving elevated temperatures resulting from supersonic flight. This will require the use of adhesives with high-temperature properties better than those of Metlbond film or FM-45.

Convair is now cooperating with adhesive manufacturers in an attempt to develop a high-temperature-resistant adhesive with good production characteristics. Present Metlbond adhesives are limited in their effective use to a maximum temperature of about 180F while under load. At the higher speeds expected to be encountered in the near future, bonding cements resistant to higher temperatures will undoubtedly be required in certain areas, Convair says.

Also contemplated is some work with

sandwich-type construction, using a glass-fabric-base core and metal surface plates.

▶ **Two Adhesives**—Developed by Convair, Metlbond was conceived as a weight-saving device, allowing use of thinner skin than required by the more conventional construction (AVIATION WEEK June 19, 1950, p. 20). It also was found that this metal adhesive improved aerodynamic smoothness.

Convair developed several of the adhesives. Two of these, designated M3C and N2, were outstanding. Excellent results were obtained by a combination of these two cements. MN3C tape, a dry film adhesive containing separate layers of the two materials, has proved to be particularly effective from a production standpoint, Convair claims. It possesses shear strength and flexibility.

M3C, the flexible metal adhesive, establishes a bond to the metal surface. N2, a low-pressure adhesive, is thermoplastic prior to cure, equalizes pressures by filling small irregularities resulting from imperfectly matched parts or imperfect tools.

▶ **Results Point Way**—As the process has been improved, Convair's use of Metlbond has gradually expanded. Early in 1950, Convair recognized further advantages of metal adhesives in aircraft construction through experience with panels on the B-36 center panel trailing edge with this makeup.

This area had proved to be particularly susceptible to fatigue failures resulting from vibration from the six engines with pusher props. The panel stiffeners that were attached with metal adhesive, even though made from thin magnesium skin, were among the parts that did not fail after a few hundred hours of flight.

As a result, other panels were made in this manner when parts were redesigned. Improved production methods were sought to cope with the manufacture of the greatly increased number of parts.

It also was seen that use in true primary structures would require more knowledge of design criteria and improved control of production processing.

▶ **B-36 Applications**—Although many potential applications for metal adhesives exist in aircraft construction, present uses on the B-36 are confined to thin skins. It has been found that these can be attached to doublers and reinforcing members through the adhesive process for a smooth exterior surface.

Approximately 5,600 sq. ft.—about 28%—of the B-36's 20,000 sq. ft. of external surface is covered with reinforced skin assemblies fabricated with the Metlbond process. Practically no internal parts of the B-36 use Metlbond. Applications on the all-jet YB-60 are

Here is the answer to a frequent question we receive from people everywhere. Yes, Cannon *does* make a complete line of accessories to be used in conjunction with the AN Series of connectors. Complete engineering data on each of these is given in the Cannon AN Bulletin, available on request.

CANNON ELECTRIC

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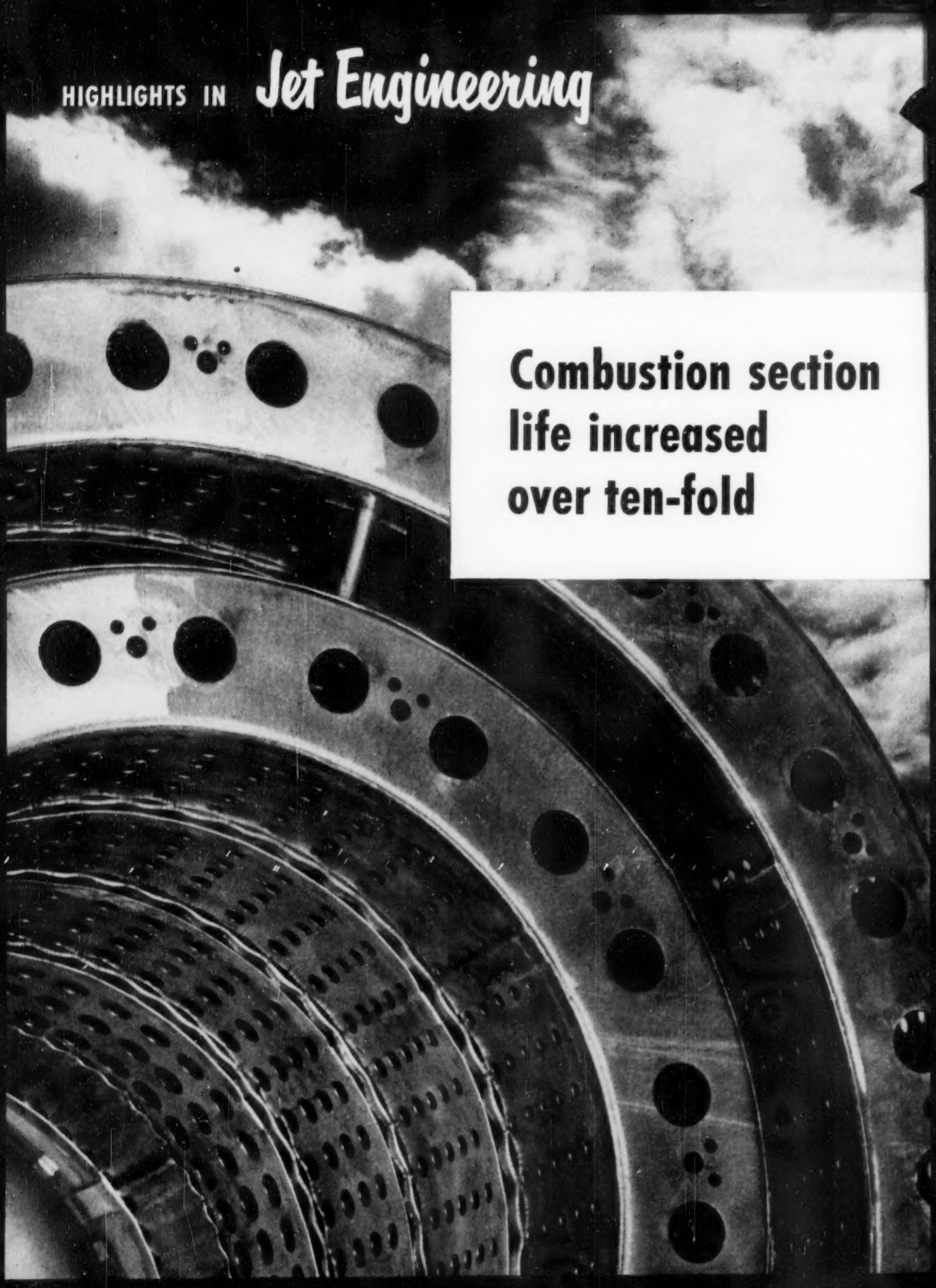
HIGHLIGHTS IN *Jet Engineering*

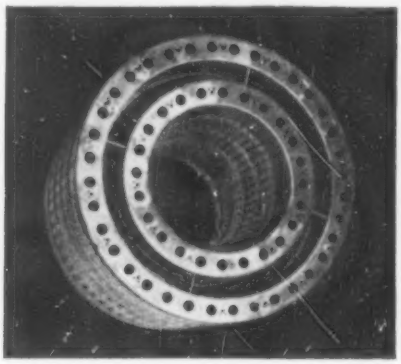


Combustion section life increased over ten-fold

The combustion section of jet engines was given an unprecedented lease on service life with the introduction of the "step wall" liner. The unique design of this combustion chamber liner has proved itself beyond question in the unequaled combat record of the Westinghouse J34 engine. By eliminating severe hot spots and their heavy engine damages, the liner answered one of the most critical of all service-life problems.

The actual design features of the "step wall" liner, a Westinghouse patent, stand out at a glance. In place of the usual cylindrical sheet metal construction, telescopic circular sections have been fitted together. This gives the liner a stepped contour, instead of a flat surface, allowing a continuous blanket of relatively cool air to pass over its surface. The result: protection from the ravages of temperatures over 3000°F.

While the J34 was setting its unparalleled combat records in Korea, Westinghouse engineers were designing another new jet engine, using the "step wall" liner—the J40. Already severe altitude and wind-tunnel tests have been made. Again new records have been set . . . over 700 hours without a major component change. And again Westinghouse engineers have new designs on their drawing boards . . . new plans to keep advancing the jet engineering of today, with an eye to faster, more economical air transportation tomorrow. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-54015



"Step Wall" Liner—Full view of combustion chamber liner shows stepped contour design on both inside and outside sections.

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Westinghouse

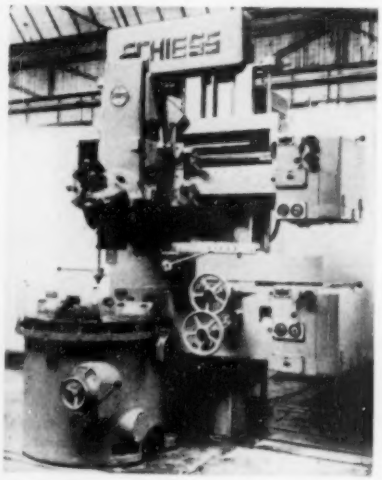
Is that a bombsight
in your BASEMENT?
Of course it could be. But it would be a simplified version with its chore associated with controlling the heat for your home, or the deep-freezer, or the automatic washing machine and dryer, rather than computing the point for "bombs away". This is an age of instruments and systems — an age in which the name NORDEN has come to stand for highest precision. Bombsights for the military services yesterday . . . highly advanced equipments for them today . . . still more for the Country's defense — and for industry — tomorrow.
Norden
instruments and systems of highest precision
MILFORD, CONNECTICUT
WHITE PLAINS, NEW YORK

almost identical to those on the B-36.

► **Production Factors**—Advantage of Metlbonding in high-volume production is based on the fact that it can be used with production-type equipment. Detail parts can be stamped out, assembled with adhesive, then placed in curing presses made to fit the individual parts, to complete the bond without additional manpower.

Main disadvantages from a production viewpoint are the type of equipment and training required. Tooling is comparatively simple so long as Metlbond assemblies can be made flat and bent to contour after fabrication.

However, the use of more complicated assemblies and heavy skins necessitate tooling that fits the final contour. This requires that separate tools, provided with means of applying pressure and heat, be fabricated for each part.



Highspeed Lathe

A German-made turret lathe for high-speed production with carbide tools has been developed by Shiess A. G. and is being distributed by Kurt Orban Co., Inc., 205 E. 42 St., New York.

The machine is fitted with a vertical, single column. A rotable holder, mounting up to five tools, moves vertically down to a table that turns at speeds up to 310-rpm. The table handles multiple workpieces of a total weight up to three tons.

Vibration and play are said to be virtually eliminated in the machine. This is achieved primarily through the drive arrangement, the distributor says. The main motor is mounted in a vertical position on the back of the lathe and is connected directly to a gear box through a vibration-absorbing coupling. The gear box also is vertically mounted so that changes in direction of drive are transmitted to the table without bevel gears. The machine is built with work table diameters of 39, 49, and 65 inches.

USAF Contracts

Following is a list of recent USAF contracts announced by the Air Materiel Command.

Aeroflex Labs., Inc., 34-06 Skillman Ave., Long Island City 1, N. Y., stabilized mount & spares, $952,864.

Consolidated Car-Heating Co., 413 N. Pearl St., Albany 1, N. Y., gun charger, 2,027 ea., $59,379.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., indicator, 926 ea., 409 ea., 261 ea., $30,067.

Fairchild Engine Div., Fairchild Engine & Airplane Corp., Farmingdale, L. I., N. Y., powerplants & spare parts, $85,630.

Goodyear Tire & Rubber Co., 1144 E. Market St., Akron, brake & misc. parts, $1,062,106.

Hayes Aircraft Corp., P. O. Box 2287, Birmingham, bomb bay spray systems, 100 ea., $500,000.

Inter-Mountain Theatre Supply Co., 264 E. 1st South, Salt Lake City, mixer, distribution kit, 186 ea., $84,896.

Walter Kidde & Co., Inc., 675 Main St., Belleville, N. J., carbon dioxide transfer unit, 129 ea., commercial data, 521 ea., engineering data, 1 set, $47,597.

Pako Corp., 1010 Lyndale Ave., Minneapolis, drum assembly, 50 ea., dryers, paint, 20 ea., washers, paint, 66 ea., $50,167.

Royal Electric, Inc., Jamestown, Ohio, generators, 400 ea., $50,600.

Mark Simpson Mfg. Co., Inc., 32-28 49th St., Long Island City, mixer amplifier, 2,282 ea., 44 ea., 556 ea., spare parts, mixer amplifier, 11 ea., $116,828.

Fairchild Camera & Instrument Co., 88-06 Van Wyck Blvd., Jamaica 1, N. Y., kit, 1,953 ea., handbook data, 1 set, $69,860.

Fairchild Engine & Airplane Corp., Fairchild Aircraft Div., Hagerstown, Md., spares for aircraft, $27,133.

Gilfillan Bros., Inc., 1815 Venice Blvd., Los Angeles 6, countermeasure trainer, 1 ea., 64 ea., spares, $4,961,065.

Johnson Fare Box Co., 4619 Ravenswood Ave., Chicago 40, gun charger, 2,233 ea., 2,234 ea., 329 ea., $1,623,895.

National Metal & Steel Corp., Terminal Island, Calif., generating set, 2 ea., $137,014.

Pacific Optical Corp., 3965 W. 98th St., Los Angeles, lens assembly, 1,160 ea., $67,280.

Ryan Industries, Inc., 19159 John R. St., Detroit 3, magazine, spare parts, carrying case, 1,388 ea., $1,130,707.

Stanley Aviation Corp., Buffalo Municipal Airport, Buffalo 25, belt, 1,250 ea., 3,750 ea., $404,655.

Stratford Pen Corp., 44 W. 28th St., New York 1, control panel, 3,538 ea., $59,796.

White-Rodgers Elect. Co., 1209 Cass Ave., St. Louis 6, control-turbo, 91 ea., $67,330.

Navy Contracts

Contract awards recently announced by Naval Air Material Center, Supply and Fiscal Dept., Philadelphia, include:

Breeze Corps., 41 S. 6th St., Newark 7, N. J., sparkplug lead assemblies, $234,350; lead assemblies, $90,145; ignition harness, 166 ea., $241,728.

Parker Appliance Corp., 17325 Euclid Ave., Cleveland 12, fuel valve, 150 ea., $74,935.

Edison, Inc., Thomas A., 51 Lakeside Ave., West Orange, N. J., gage, engine unit, 1,669 ea., $154,869.

Goodrich Co., B. F., 500 S. Main St., Akron 18, boot, de-icer, $117,545.

Lear, Inc., 110 Ionia Ave., N. W., Grand Rapids 2, maintenance parts for various aircraft, $81,257.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., plug, contact, $25,068.

Goodyear Tire & Rubber Co., Inc., 1144 E. Market St., Akron 16, wheel assembly, 1,287 ea., $214,041; maintenance parts used

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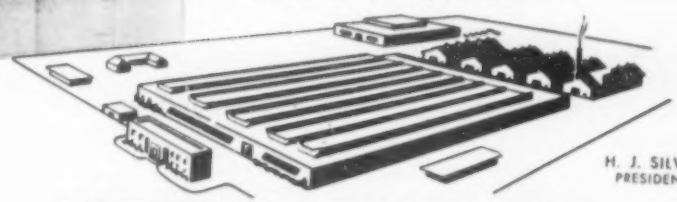

H. J. SILVER
PRESIDENT

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FOOD MACHINERY & CHEMICAL CORP.
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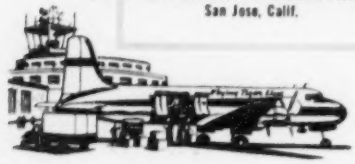

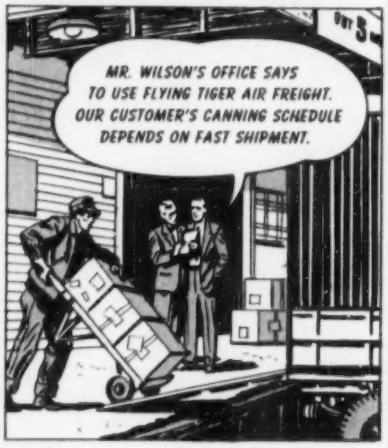

FOOD MACHINERY SURE WANTS THIS CARGO DELIVERED PDQ.
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on brake & wheel assemblies, $571,278.

Federated Metal Div., American Smelting & Refining Co., 120 Broadway, New York, zinc alloy, ingot, 158,600 lb., $28,092.

Thompson Prod., Inc., 23555 Euclid Ave., Cleveland 17, pump assembly, 133 ea., $39,924.

United States Gage Div., American Mach. & Meta's, Inc., Sellersville, Pa., transmitter, pressure, $64,214.

Electrol, Inc., 25 Grand St., Kingston, N. Y., valves, hydraulic pressure, $65,137.

Link Aviation, Inc., Nolan Road, Hillcrest, Binghamton, N. Y., washer, spring thrust, $114,941.

Hughes Aircraft Co., div. of Hughes Tool Co., Culver City, Calif., parts for aviation armament, $448,525; spare parts for aviation armament, $290,285.

Kenyon Instrument Co., Inc., 1345 New York Ave., Huntington Station, Long Island, N. Y., resistors & valves, $99,223.

Fairchild Camera & Instrument Corp., 8806 Van Wyck Blvd., Jamaica, L. I., N. Y., maintenance parts for ranging throttle grip & gunsight controller, $102,448.

Maxson Corp., W. L., 460 W. 34th St., New York 1, spare parts for aviation armament, $212,187.

General Aniline & Film Corp., Ansco Division, Binghamton, N. Y., film, $27,186.

Koehler Aircraft Products Co., Inc., 814 Vermont Ave., Dayton 4, valves, $32,194.

Weatherhead Co., 300 E. 131st St., Cleveland 6, hose, various lengths, $30,203.

Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Calif., piston, 23 ea., $26,008.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., oxygen regulator, 240 ea., $42,610; instruments for various aircraft, $62,222.

Electric Auto-Lite, 1201 Champline St., Toledo 1, sparkplugs for various aircraft, 43,600 ea., $53,192.

Lear, Inc., 110 Ionia Ave., N. W., Grand Rapids 2, screw jacks, shafts and actuators, $53,529.

Reynolds Metals Co., 2500 S. Third St., Louisville 1, tubing, aluminum alloy, 57,640 lb., $71,070.

Goodrich Co., B. F., 500 S. Main St., Akron 18, wheel assemblies, 69 ea., $97,931; maintenance parts used on wheel and brake assemblies, $226,285.

Greer Hydraulics, Inc., 454 18th St., Brooklyn 15, portable hydraulic test stand, 60 ea., $169,285.

Goodyear Tire & Rubber Co., Inc., 1144 E. Market St., Akron 16, wheel assemblies, 950 ea., $393,616; brake & wheel assemblies for various aircraft, $204,526.

Schuttig & Co., Inc., 9th & Kearny St., N. E., Washington 17, D. C., main channel tuning assembly, 346 ea., $78,023.

Airborne Accessories Corp., 1414 Chestnut Ave., Hillside 5, N. J., actuator assemblies, $75,970.

Electrol, Inc., 85 Grand St., Kingston, N. Y., valve assemblies, $39,146.

Blakeslee & Co., G. S., 1844 S. 52nd Ave., Cicero 50, degreaser, 12 ea., $29,964.

Martin Co., Glenn L., Baltimore 3, maintenance for PBM aircraft, $134,580; stacks and support assemblies for PBM aircraft, $190,648.

Joy Mfg. Co., 4235 Clayton Ave., St. Louis 10, cable assembly, 600 ea., $31,530.

Engineering & Research Corp., Riverdale, Md., parts for aviation armament, $32,764.

Rubbercraft Corp. of America, Inc., 151 Orange Ave., West Haven, Conn., lifecraft, 115 ea., $67,542.

Van Norman Co., Springfield, Mass., milling machines, 10 ea., $159,750.

Pratt & Whitney Div., Niles-Bement-Pond Co., Commerce Station, 401 N. Broad St., Philadelphia 8, vertical jig borer, Model 2-A-3644, 2 ea., $50,112; Model 3-B, $62,852.

Machinery Associates, Inc., 325 E. Lancaster Ave., Wynnewood, Pa., Avey BMA-6 drilling machines with single spindle, 10 ea., $21,160; Avey BMA-6 drilling machines with double spindle, 10 ea., $32,820.

Cincinnati Milling & Grinding Machines, Inc., 580 Lancaster Ave., Bryn Mawr, Pa., cutter and tool grinders, Cincinnati Model 2, 8 ea., $33,246.

Fisher Governor Co., 1700 Fisher Bldg., Marshalltown, Iowa, valve assembly, NAF Part #92420-1, 75 ea., $81,760.

An extruded shape of twice this area can be stretched by Alcoa's new 3,000,000-pound stretcher

This companion equipment to Alcoa's new 13,200-ton extrusion press is four times more powerful than any stretcher in existence. When it is installed, it will mean larger, thinner, more intricate parts for America's fighters and bombers.

Alcoa Aluminum

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should have Alcoa "How-To-Do-It" books and sound movies to train their employees. Ask for any of the following books: *Forming Alcoa Aluminum, Designing for Alcoa Die Castings, Designing for Alcoa Forgings, Alcoa Aluminum and Its Alloys.* Sound films are available on most fabrication processes.

GE Capacitor Is Small but Rugged

Avionics goal of reliability, decreased size should be aided by new line; size saving averages 20%.

Hudson Falls, N. Y.—Avionics designers, always under pressure to make their equipment smaller and more reliable, should get a helping hand from a new line of wide-temperature-range capacitors developed by General Electric's Capacitor Dept. here.

The new metal-clad, hermetically sealed tubular capacitors are:

• **Smaller.** They are reported to average 20% smaller than comparable oil-filled units.

• **More rugged.** They use an unbreakable silicone bushing instead of the fragile glass end-seals previously used in tubular capacitors.

The capacitors will come in standard 100-, 200-, 400- and 600-v. ratings, in the range of 0.001 to 1 mfd. GE says that sample quantities will be available in April.

First public showing of the new line will be made at the Institute of Radio Engineers Convention in New York, Mar. 23-26.

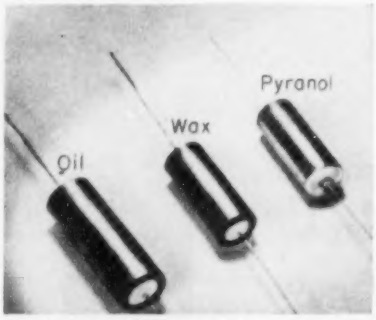
▶ **Filling a Void**—The new line fills a void created last summer when the Armed Services Electro Standards Agency (ASESA) decided to drop Characteristic J wax-filled capacitor from proposed MIL-C-25 capacitor specification. This action stemmed from wax-filled capacitor's reported lack of stability at extreme temperatures (—55C and 85C).

Equipment that was being designed for operation in the —55C to 85C range had to have wax-filled capacitors replaced with MIL-C-25 Char. "E" mineral-oil filled capacitors. Because oil has a lower dielectric constant than wax, these units averaged about 20% larger than the Char. J wax units.

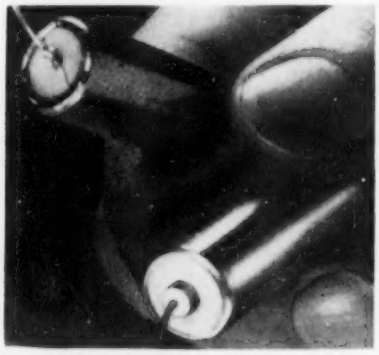
▶ **New Type Pyranol**—Pyranol, the liquid dielectric used in GE's commercial capacitor line, is in many ways, better dielectric than mineral oil, except at extremely low temperatures. GE's chemists went to work and came up with a new type of Pyranol which retains its dielectric quality (capacitance) from 85C to —55C, within the 15% allowed by MIL-C-25.

The result is a capacitor that meets the performance specs of Char. E, but is as small as the abandoned wax Char. J.

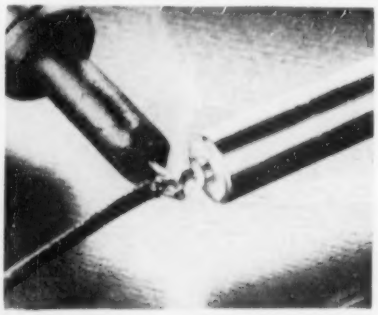
Large capacitance-value units in the new line are as much as 30% smaller than comparable mineral oil capacitors, GE says. The overall average decrease throughout the line is about 20%, GE reports.



PYRANOL CAPACITATOR meets —55C to 85C temperature specs for oil-filled unit and is 20% smaller. Wax unit, also small, can't stand extreme temperatures.



SILICONE END-SEAL (right) is unbreakable, unlike brittle glass end-seal.



SOLDERING to capacitator lead is possible with silicone seal.

▶ **Glass Seal Troubles**—The glass end seals previously used in metal-clad tubular capacitors have been a continuous headache both to General Electric and to equipment manufacturers and users, GE says.

In spite of special precautions and handling, a sizeable percentage of GE's output went into scrap. Dropping a capacitor, or excessive heat when soldering on the capacitor's end leads, would crack or break the seals.

Even worse, stresses set up in the glass in assembly, or scratches too tiny to see, might cause equipment failures at a later date. A Bell Telephone Labs spokesman confirmed these glass seal troubles in answer to an AVIATION WEEK inquiry.

▶ **Silicone Bushing**—The new silicone bushing provides a good hermetic seal and makes the capacitor almost impervious to damage from normal handling or useage.

As a result of this, GE is also switching its line of Permafil capacitors to the new silicone seal.

The Permafil units are rated for temperatures of —55C to 125C, but can be used at temperatures up to 150C with slight derating.

NATO Personnel Get GCA Course

(McGraw-Hill World News)

Frankfurt—Technicians from NATO nations' air forces will learn how to maintain and trouble-shoot their U. S.-built GCA radar equipment at the USAFE Joint Communications Training Center in Freising, near Munich, in a program designed to save the expense and time of sending technicians to the U. S. for schooling.

The first class, already underway, is training two Italian air force officers and 10 enlisted men. It will last 23 weeks.

Personnel from other NATO air forces will be enrolled in new classes, scheduled to be formed every 18 academic days.

Representatives of Gilfillan Brothers, Inc., of Los Angeles, who make the GCA equipment, and members of the 7490th Technical Training Squadron, are serving as instructors.

Marconi Asks CAA Aid

(McGraw-Hill World News)

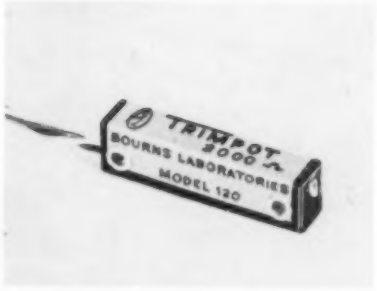
London—Marconi's Wireless Telegraph Company Ltd. has asked the Civil Aeronautics Administration to help finance a demonstration of its visual omni-range equipment here in an effort to compete with Great Britain's standard Decca VOR and new equipment now being produced by Lorenz of Germany.

CAA officials here in London said they are trying to arrange the Marconi demonstration.

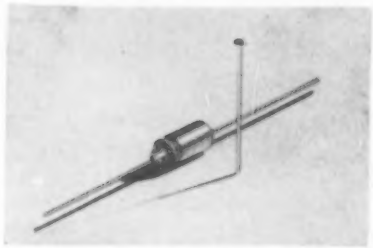
It's a Small World

Four tiny new components, two of them called the "world's smallest" by their manufacturers, should assist avionics engineers in their continuing quest to achieve for size and weight reduction.

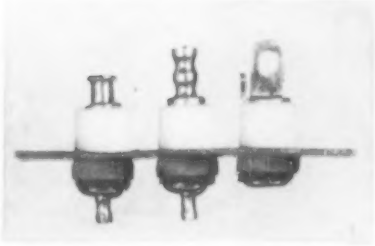
The devices are:



• **Trim potentiometer.** This novel linear potentiometer is adjusted from a slotted shaft exposed at one end of the device. The design prevents loss of setting due to vibration or shock and permits units to be compactly stacked on top of one another. Called Trimpot, it is available in resistances of 250 to 10,000 ohms in ½-watt ratings from Bourns Laboratories, 6135 Magnolia Ave., Riverside, Calif.



• **Microlytic capacitor.** New Type 999 Microlytic (electrolytic) capacitors only 0.175 in. in diameter and ¼ in. long are now available in ratings up to 50 volts. Maximum operating temperature of 65C may, however, limit device's use in avionics equipment. Micamold Radio Corp., 1087 Flushing Ave., Brooklyn 37, N. Y.



• **Hermetic terminals.** Miniature terminals using either silicone rubber or oil-resistant neoprene seals are easily assembled in punched or drilled holes. Terminals are designed for operation at 500 v. and 8 amp. Manufacturer is Lundey Associates, Waltham, Mass.

• **Precision carbon potentiometer.** Called the "first miniature precision potentiometers of infinite resolution," new Type 105 carbon-film potentiometer is designed for use in airborne analog computer-type applications where excellent resolution and small size are needed. Unit measures 1⅛ in. dia. by ¼ in. long and weighs one ounce. Unit has built-in trimming arrangement which allows factory adjustment to linear or non-linear functions. Pots are available in single or multiple-gang assemblies from Micromax Co., 1964 Utica Ave., Brooklyn, N. Y.

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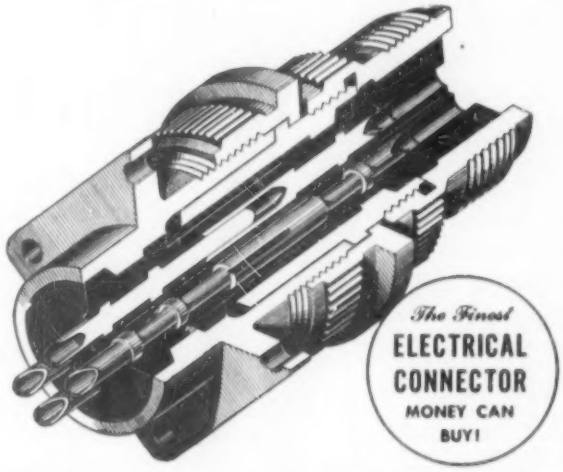
When operating conditions demand an electrical connector that will stand up under the most rugged requirements, always choose Bendix Scinflex Electrical Connectors. The insert material, an exclusive Bendix development, is one of our contributions to the electrical connector industry. The dielectric strength remains well above requirements within the temperature range of −67°F to +275°F. It makes possible a design increasing resistance to flashover and creepage. It withstands maximum conditions of current and voltage without breakdown. But that is only part of the story. It's also the reason why they are vibration-proof and moisture-proof. So, naturally, it pays to specify Bendix Scinflex Connectors and get this extra protection. Our sales department will be glad to furnish complete information on request.



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Insulating Varnish

Silicone Varnish 994 resists heat better than any other silicone electrical insulating varnish known, its developer, Dow Corning, says.

The new compound is used mainly for coating glass cloth and sleeving and for bonding mica-glass combinations. It is said to have more than three times the dielectric life of similar products on the market.

At 482F, company tests show 994 coatings have a flex life of more than 1,000 hr. and craze life exceeding 3,000 hr.; flex life exceeds 500 hr. at 572F. The coating cures in about one hour at 482F.

Dow Corning Corp., Midland, Mich.

Collins IFS Approved

Collins Radio has received CAA type-certification of its Integrated Flight System for use on airliners. The Collins IFS presents airplane heading, attitude, and omnirange and ILS approach steering information to the pilot on two multi-purpose instruments which can replace four or five standard panel instruments. IFS, which is being used in many executive-type transports, is currently being evaluated by several major airlines, Collins says.

Console Recorder

A new six-channel recorder suitable for use with analog computers has been designed into a desk-type console by Goodyear Aircraft Co. Coefficient potentiometers located on the back panel of the new R5 Geda recorder can be connected into the analog computer, enabling the operator to change problem parameters and make new runs without leaving the desk console.

The recording elements operate with either ink pens in curvilinear coordinates or with hot-wire pens in rectilinear coordinates. Recorder sensitivity is continuously variable between 0.01 and 100 volts/mm. and frequency response is essentially flat to 100 cps. when ink pens are used, Goodyear says.

FILTER CENTER

▶ **New Navy GFE Policy**—Under recently announced policy, Navy airframe manufacturers will purchase all components of the electrical generation and distribution systems used in their aircraft instead of having some of these items supplied by the Navy as government-furnished equipment. Airframe manufacturers must still select components from Navy's approved list of products. This change is not expected to affect Navy policy under which communications, navigation and fire-control equipment are government-furnished.

▶ **N. Y. ARTC Swaps VHF Frequencies**—To eliminate interference encountered on one of its new remote VHF stations (AVIATION WEEK Jan. 26, p. 38), the New York Air Route Traffic Control center will swap frequencies with one of its local

trained hands reach for precision-made instruments

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Designed especially for engineers and draftsmen, precision-made MICROTOMIC Drawing Pencils meet every requirement. The result of over a century of pencil-making "know-how" backed by constant Eberhard Faber research. See the difference—prove it to your satisfaction!

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(Douglaston) VHFs. New Scranton frequency will be 125.7 mc.; new frequency for Douglaston will be 125.9 mc.

▶**Clevite Expands Avionics Interests**—Clevite Corp., formerly Cleveland Graphite Bronze Corp., has acquired majority stock interest in Transitor Products, Inc., Boston, which was organized early in 1952 to develop and manufacture transitors and diodes. Clevite recently purchased Brush Electronics Co. of Cleveland which makes recorders, widely used in the aviation and avionics industries.

▶**Lear Eyes Copter Field**—Lear, Inc., is considering entering the helicopter autopilot field, as evidenced by recent engineering discussions with Sikorsky and Bell Aircraft engineers. Both Sikorsky and Bell have been developing their own helicopter autopilots. Piasecki Helicopter Co., on the other hand, had previously turned to Minneapolis-Honeywell and Sperry Gyro for the development of autopilots for its helicopters.

▶**Sub-Min Capacitor Development**—Signal Corps is expected to award contract soon for the development of subminiature capacitors for use with transistors. Industry needs smaller capacitor if space-saving potentialities of transistors are to be fully realized.

▶**High-Flying Test Gear**—Bendix Pacific Division will test its avionics products in a new stratosphere chamber capable of simulating 150,000-ft. altitude.—**PK**

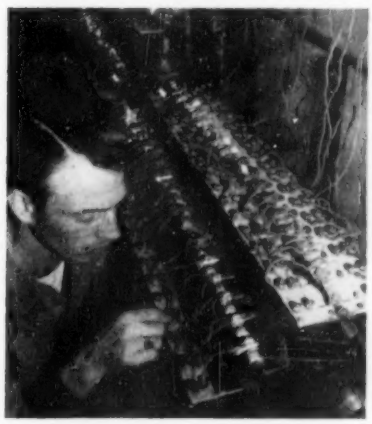

TABLE TESTS SWITCHES

To speed testing of small mercury switches used in its autopilot, Minneapolis-Honeywell devised this motor-operated tilt-table. (When switch is tilted, pool of mercury flows between two electrical contacts to close the circuit.) M-H says switches are subjected to 150,000 test operations.

triple threat

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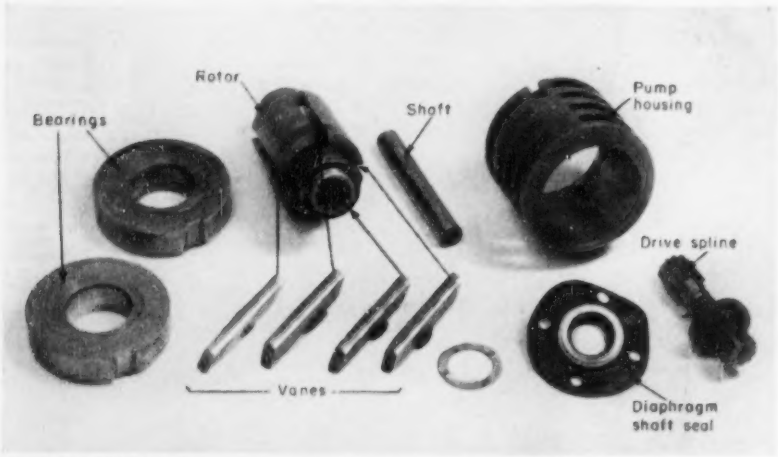


DISASSEMBLED Pesco vane-type pump showing new removable drive spline.

Pesco Pumps Fly on All U.S. Jets

Company's new 'pressure-loaded' gear pump meets both low- and highspeed needs of turbine powerplants.

By George L. Christian

Bedford, Ohio—Primary fuel pumps for jet aircraft engines bring in 40% of Pesco Products' aircraft business dollar volume. The company's complete line includes various types of liquid and air pumps, pneumatic drives and electric motors. In a typical month, the firm ships more than 400 different items.

► **Early Bird**—Pesco supplied the primary fuel pump for the first U. S. jet, General Electric's I-A, and it has had a fuel pump available for every American-built jet engine since. Every U. S. jet engine flying today is equipped with Pesco fuel pumps, the company says. Sweden's speedy Saab-29 jet fighters use Pesco unloading gear pumps.

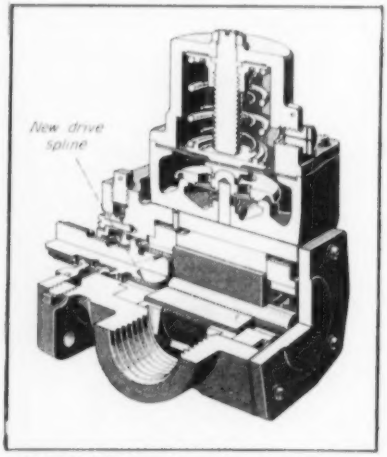
The pump line starts with small single-element units which deliver 275 gph. and goes up to double-element units which can ladle out fuel at over 5,000 gph. The double-unit pump includes a centrifugal booster supplying fuel to the double-element main gear-type units. One of these elements is extra large, to deliver fuel to the after-burner when necessary.

Pesco technicians say that with the multiple pump one unit supplies all the engine's fuel-pumping requirements, eliminating the need for pumps scattered all over the plane.

► **Pressure-Loaded Pump**—Pesco has contributed a patented principle it calls "pressure loading" to the advance of gear pump design.

This is how it works: Two gear-supporting bearings on one side of the pump are movable along the gear shaft axis. Opposite gear-supporting bearings are fixed in the pump body. Light springs press the movable bearings against the sides of the gears when pump is at rest.

As soon as the pump starts, fluid is bled from the pressure side of the pump to a chamber behind the movable bearings. Pressure squeezes the bearings tighter against the pump gears, reducing leakage around the sides of the gears to a minimum. End clearance is limited to a thin film of fluid which helps cut frictional wear considerably.



CUTAWAY showing spline location.

Pesco cites these advantages for its pressure-loaded design:

- **Uniform fluid flow rate** despite load variations or changes in fluid viscosity over a wide temperature range.
- **Automatic takeup of wear** assures extended pump efficiencies over a long service life.
- **High operating efficiencies.** Volumetric efficiencies up to 97% and torque efficiencies up to 92% are obtained.
- **Good lowspeed volumetric efficiencies** may permit use of smaller pump. This unit, while efficient at low speed, may also be operated safely at high speeds, a particularly desirable feature for starting. Jet engine speeds are low at starting although fuel demands at that stage are high.

► **New Drive Spline**—Pesco has developed a new female drive spline for vane-type fuel pumps. It is inserted in the steel rotor body and is easily removed when worn. This single replacement avoids scrapping relatively expensive steel rotor bodies.

The bronze alloy used in the new splines is more wear-resistant than previously used material. Pesco technicians say that Braniff Airways ran the new splined pumps over 3,000 hours and, finding no appreciable wear, re-installed the unit. Other airlines using the pump are Capital, United, Northeast, Northwest and Western.

Airlines do not have to buy a new pump to take advantage of the new spline. Old pumps are converted by grinding out the old spline which was broached directly into the steel rotor body, and pressing in the new spline.

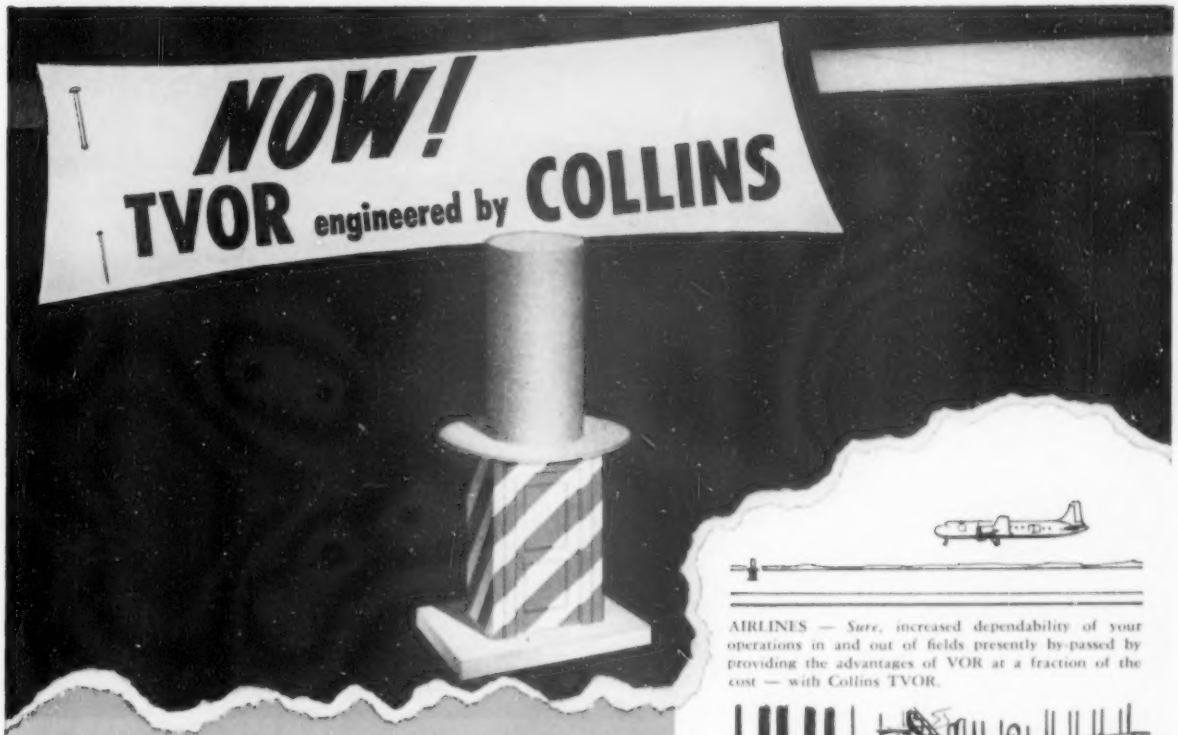
► **Fittings Kit**—Originally, Pesco sold pumps complete with outlet fittings. But because of the large number of fittings required by different aircraft configurations (internal, external, 90-deg., 45-deg., straight, off-set, etc.), inventories were large and supply problems difficult.

Pesco's answer to this problem is to make up kits of the various types of fittings, including washers, O rings, bolts and other components required to adapt the pump to a particular configuration.

The customer purchases the basic pump. Fittings kit enables him to install according to his needs.

The standardization program enables Pesco to keep fewer pumps "on the shelf." Supplying pump requirements also becomes more flexible, as one type of fitting often accommodates many different models of pump.

The purchasing agent's job is simplified too. By ordering the fittings in kit form, he gets all the needed components in one box, instead of having



A revolutionary improvement in VOR operation

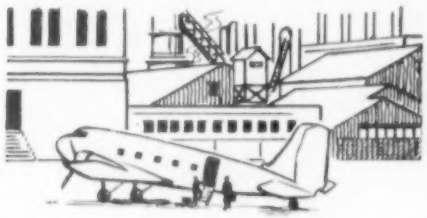
Now — *Low Cost* Visual Omni Range for any field, municipal, commercial or private in the USA or abroad. Completely dependable, the instrument navigation and approach facility is designed to meet CAA requirements. The unit is inexpensively and easily installed and maintained. Yes — Collins offers the aviation industry a revolutionary improvement in the scope of VOR operations for airlines, executive aircraft and private owners.

Collins TVOR uses a newly designed antenna, broad banded enough to be electrically non-critical, carefully engineered for matchless accuracy. It is electrically and mechanically reliable and requires practically no upkeep. This new TVOR has been engineered and built by Collins to make a more accurate, more dependable VOR available to airports *everywhere*. Collins TVOR requires no complicated construction and the installation involves no complex positioning problems.

Operating on 50 or 60 cycles, Collins TVOR is provided with speech input, eliminating the need of a transmitter in the tower. It also can be used as a landing aid for dependable instrument approaches by any plane equipped for standard VOR.

The electrical circuits, electronic equipment and all component parts of this new TVOR embody Collins quality throughout. The same outstanding engineering, advanced design and reliable performance of all Collins equipment is found in Collins TVOR.

AIRLINES — *Sure*, increased dependability of your operations in and out of fields presently by-passed by providing the advantages of VOR at a fraction of the cost — with Collins TVOR.



EXECUTIVE AIRCRAFT — Operate more efficiently with TVOR at company-owned or outlying fields. Use Collins TVOR for accurate — *safe* instrument approaches at fields not presently considered under instrument conditions.

COLLINS TVOR meets CAA requirements — easy to install and maintain — works with standard aircraft equipment. For complete details on this new development in terminal navigation and approach facilities — Collins TVOR — write today.

For advanced electronic equipment, it's . . .

COLLINS RADIO COMPANY, Cedar Rapids, Iowa

11 W. 42nd St., NEW YORK 36 **1930 Hi-Line Drive, DALLAS 2** **2700 W. Olive Ave., BURBANK**

MINUTES INSTEAD OF HOURS—In just 28 minutes New York Airways' big Sikorsky S-55s can speed loads of air-mail between 3 major airports in the New York City area. Motor trucks took hours. Eventually these helicopters will carry passengers and freight, as well as mail, to 40-odd cities in nearby New York, Connecticut and New Jersey.

AROUND THE WORLD WITH THE FLYING JACK-OF-ALL-TRADES

HIT AND RUN—U. S. Marine ingenuity and cooperation solved the problem of how to launch a rocket attack on enemy strong points, then shift positions before rocket smoke trails and dust could be used by the enemy as a guide for counter-battery fire. Here a Sikorsky Marine helicopter positions the rocket launcher and ammunition a short distance behind the front lines.

SAVING TIME AND EXPENSE—More efficient use of time is always an objective in modern business. To provide speedy, flexible transportation, the Rockwell Manufacturing Company of Pittsburgh, Pa., has adapted a Sikorsky S-55 to its extensive operations. Now engineers and operating executives go by helicopter from plant to plant. The company says overhead savings will be substantial.

LIFTED TO SAFETY—Hovering over simulated destruction, a Sikorsky helicopter shows its versatility at the Federal Civil Defense Staff College by plucking an "injured man" from the ruins of a "bombed" 5-story building. Civil Defense officials say "There is no limit to the work these helicopters can do . . . in time of war . . . in any emergency."

SIKORSKY AIRCRAFT

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One of the Four Divisions of United Aircraft Corporation

For quick, safe packaging . . . of delicate light bulbs, Grumman uses **PERMACEL** Paper Tape. No doubt there is an important use for **PERMACEL** on your jobs. Our Tape Engineering Service can give you the answer . . . without obligation.

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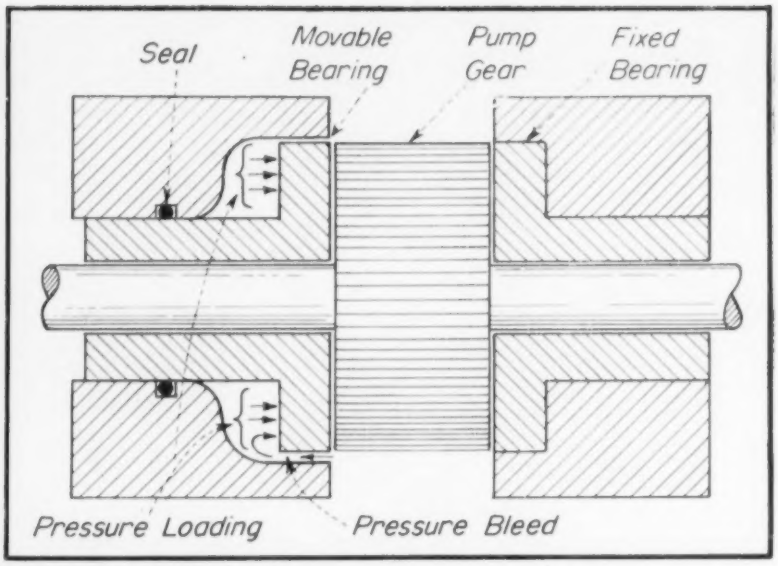
PAPER TAPES

INDUSTRIAL TAPE CORPORATION, NEW BRUNSWICK, N. J.



SCHEMATIC DRAWING of pressure-loaded pump and its features.

to order each individual nut, bolt or washer separately.

▶ **Tough Pumps**—Pesco pumps have to handle many tough jobs. The fuel pumps operate continuously at pressures up to 1,200 psi. with volumes up to 92 gpm. The only lubrication is the fuel passing through them.

To help them do their jobs, Pesco pumps are made to high precision. Journals are held to a tolerance of one micro-inch while gear faces are held flat to 2-3 light bands.

In order to solve a problem common to most pump manufacturers—drive shaft seal leakage—Pesco uses diaphrams coupled with bronze-to steel or carbon-to-steel bearing surfaces, also finished to 2-3 light band tolerance.

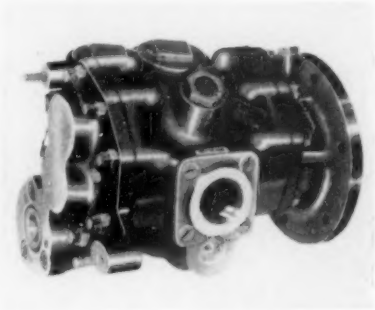
▶ **Electrical Division**—Not all of Pesco's endeavors are devoted to pumping fuel or hydraulic fluid. It puts out a wide variety of electric motors ranging from 1/100 to 6 hp. Most of the motors are a.c., but the company also makes a d.c. line for from 6 to 120 volts.

Pesco claims minimum brush wear in its motors, especially at high altitudes, as a result of good commutation.

Since one roof houses manufacture of electric motor, fuel and hydraulic pump packages, the company says precise matching of the driver and driven components is possible, saving weight and permitting considerable flexibility of output.

▶ **Pneumatics Too**—In addition to hydraulic and electric drives, Pesco has gone into pneumatic drives. On jet aircraft, where compressed air is usually more readily available than on reciprocating planes, pneumatics is getting increasing attention.

The company is in production on air-driven centrifugal water pumps for water injection systems for J47 powerplants used on North American's four-jet B-45 bombers.



DUAL-ELEMENT gear-type pump with pressure-loaded bearings.

▶ **Factory Test**—Each aircraft pump or motor made at Pesco is individually run and calibrated prior to shipment. Each unit's records are kept on file for future reference. To keep up with expanding production, six new dynamometers, capable of 50-to-100-hp. output are being installed in the company's production test department.

Pesco has submitted a sample gear-type hydraulic pump for 5,000-psi. operation to Wright Field. Other samples of this pump are in advanced stages of development and are now being subjected to test in the company's laboratories.

Pesco's employment now stands at 1,600 and is expanding. The company has a plant at Decatur, Ill. (Marvel-Schebler) and a new division is starting soon in Wooster, Ohio.

The firm, a division of Borg-Warner Corp., did $20-million business in 1952. Its executives predict a 40% increase in 1953.

sps aircraft fasteners

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All listed diameters—hex and internal wrenching types. AN specifications.

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Close tolerance, high strength, flush head type.

NAS INTERNAL WRENCHING LOCK NUTS

Superior safety nuts. Sizes from ¼" to 1½".

NAS INTERNAL WRENCHING AIRCRAFT BOLTS

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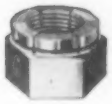
FLEXLOC



FLEXLOC SELF-LOCKING NUTS, REGULAR TYPE

Both stop and lock nuts. One piece construction, resilient segments lock positively with uniform torque. Aircraft approval, sizes # 4 to 1¼" inclusive. Regular steel FLEXLOC approved for temperatures to 550°F.

FLEXLOC SELF-LOCKING NUTS, THIN TYPE

Less than regular height, yet conform to accepted standards. Every thread, including the locking threads, carries its share of load. Have all regular FLEXLOC features, but save weight and height. Aircraft approval, # 6 to 1¼".

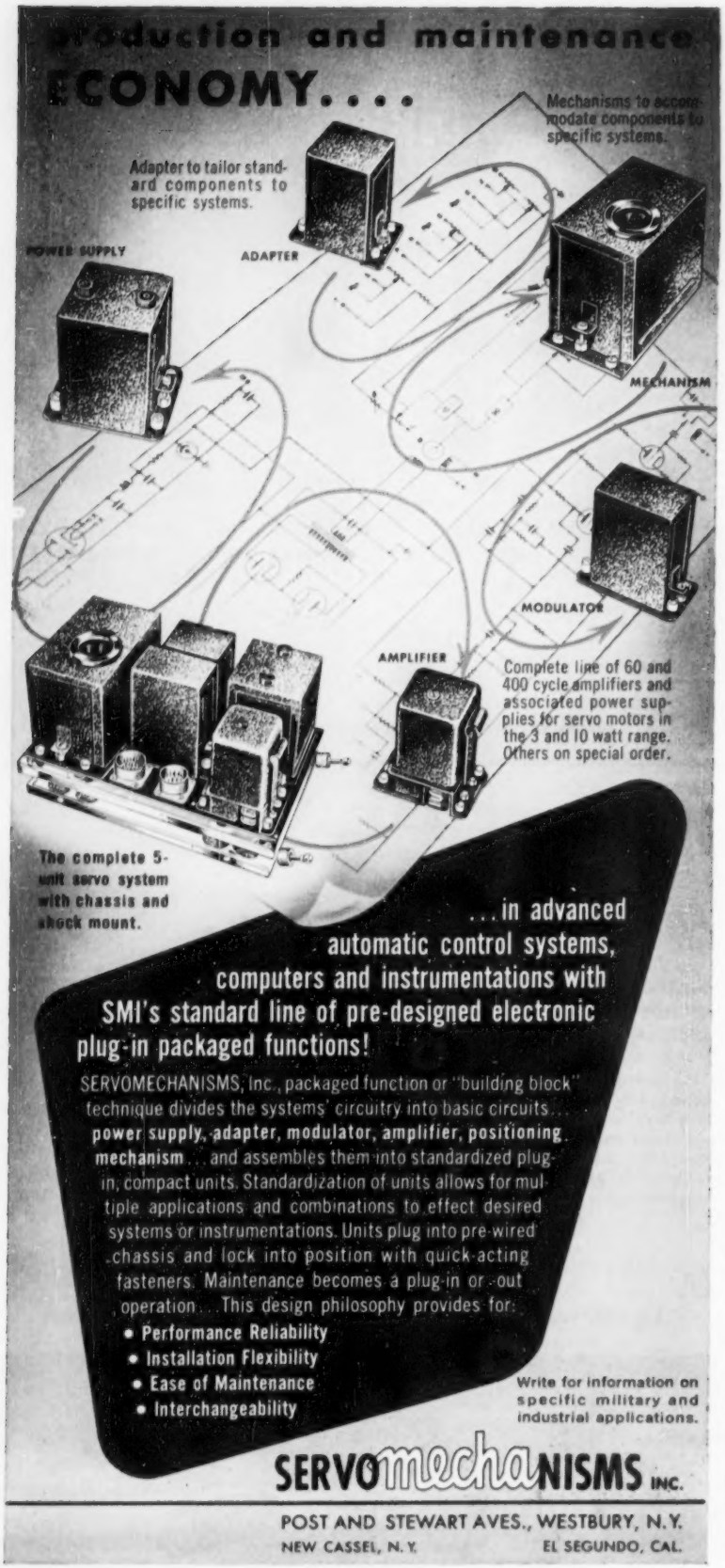
FLEXLOC EXTERNAL WRENCHING NUTS

Incorporate famous FLEXLOC self-locking principle and one-piece, all-metal construction. Latest NAS specifications. Sizes from ¼" to 1½" NF Thread Series. Approved for temperatures to 550°F.

INFORMATION ABOUT FLEXLOC ON REQUEST. ADDRESS DEPARTMENT 51,

AIRCRAFT PRODUCTS DIVISION

STANDARD PRESSED STEEL CO., JENKINTOWN 3, PENNSYLVANIA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Complete line of 60 and 400 cycle amplifiers and associated power supplies for servo motors in the 3 and 10 watt range. Others on special order.
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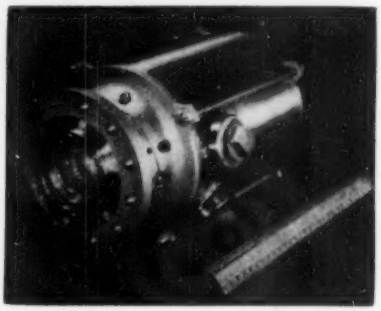

Jet Power Measured

Hydra-Brake can be mounted like an accessory on an engine drive pad to permit accurate measurement of power delivered at the shaft, says its developer, Industrial Engineering Co.

Accessory power takeoffs on jet engines have been studied by the device, according to the firm. It is a water brake-type dynamometer which uses heat rise to measure power.

The standard unit is capable of absorbing power loads up to 1,000 hp. Advantages claimed for the units are light weight (35-55 lb.) and small size (14 x 10 in.), enabling them to be carried easily and mounted without supports. They are equipped for conventional pad mounting (per AND 20001 and AND 20002), but unusual mounting can be accomplished with adapters supplied by the maker.

High performance claimed for the Hydra-Brake lies in design whereby the spinning action of the rotors causes water to form into a layer around the inner periphery of the brake housing. A high rate of shear is applied to this water layer by the whirling disks to provide high-performance drag action. The drag is augmented greatly by acceleration and deceleration of the water as it passes through the rotating member ports on its way from the inlet to the discharge port of the brake.

Industrial Engineering Co., Island Rd. and Suffolk St., Philadelphia 42, Pa.

Hydraulic Coupling

A Navy-tested hydraulic hose coupling that makes leakproof links at pressures up to 5,000 psi. when tightened by hand has been announced by Eastman Mfg. Co.

The coupling—successfully used on Navy rocket launchers—speeds hydraulic hose assembly and maintenance by allowing hand-tightened connections, the company says. The Eastman Dryseal

. . . with Johns-Manville THERMOFLEX BLANKETS

The North American Sabre Jet, powered with the General Electric J47 turbojet engine, has flown through the test of combat with highest honors.

THIS PRODUCTION LINE SCENE in the North American Aviation plant at Los Angeles shows Thermoflex* Insulation Blankets being applied to tail pipes of North American Sabre Jets on order for the United States Air Force.

Now standard protection for many Air Force and Navy jet aircraft, these flexible blankets insulate and protect the airframe against searing heat generated by jet power.

Thermoflex Blankets are custom-fabricated with highly stable Thermoflex RF Felt. This newly developed refractory fiber felt is sealed between sheets of corrosion-resistant metal foils. In manufacturing Thermoflex Blankets to specification, careful attention is given to the accuracy of cutouts for engine supports, actuator mountings, fuel lines, thermocouple leads and other controls. The precision-formed grooving and edges of the blanket . . . the close fit at cutouts . . . maintains maximum insulation value for the entire application. Furthermore, edges at cutouts are suitably sealed to prevent fuel penetration into the felt insulation filler.

In addition to insulating tail pipes, engine cones, turbine casings and afterburners . . . Thermoflex Blankets in special preformed shapes are used to insulate, protect, and fireproof fluid storage tanks, air-conditioning systems, thermal de-icing ducts and many other assemblies in all types of aircraft.

Why not send for your free copy of the illustrated folder IN-136A? It tells the complete story of Thermoflex Blankets for aircraft power plants and airframes. Address Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay Street, Toronto 1, Ontario.

*Reg. U.S. Pat. Off.

JOHNS MANVILLE PRODUCTS

Johns-Manville PRODUCTS for the AVIATION INDUSTRY

One of the major advances in television reception is the result of Pittsburgh Plate Glass Company research that produced Teleglas. Within less than a year after its first commercial use, this "gray glass" had become the industry's standard facing for cathode-ray picture tubes. The sharp contrasts and the elimination of dazzling brightness, faded grays and "halos" are the contribution of PPG Teleglas to the modern television receiver.

A leader in glass research—and with 70 years' experience in large volume glassmaking—Pittsburgh Plate Glass Company is now drawing upon these skills in the manufacture and development of Fiber Glass. If your products use Fiber Glass—either Superfine Insulation, or Yarns, Strands or Roving—there may be advantages you can obtain by specifying "*Pittsburgh*." You are invited to obtain complete information on facilities for serving you. Pittsburgh Plate Glass Company, 632 Duquesne Way, Pittsburgh 22, Pa.

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If your products need light-weight, durable insulation . . . if they require exceptionally strong reinforced plastics . . . if they need tough, weather-proof, flame-proof fabrics, or highly efficient electrical insulation—then PPG Fiber Glass may be an important factor in your planning. Field engineering service, or product data and other information, may be obtained through executive offices in Pittsburgh, or district sales offices in Chicago, Cincinnati, Cleveland, Detroit, New York and Washington.

FIBER PPG GLASS PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

pipe thread in the coupling is designed to permit continued operation of a damaged unit until the old coupling can be replaced.

Eastman's new coupling has been tested at 5,000 psi. on hose of from 1 to 1¼ in. inside diameter, using a standard O-ring seal.

Eastman Mfg. Co., Manitowoc, Wisc.

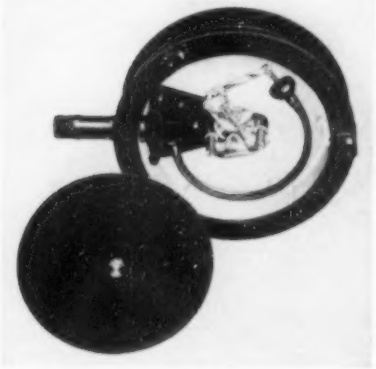
Efficient Armature

A new line of Barber-Colman motors has an armature winding 25% more efficient than any other aircraft motor now produced, the manufacturer claims.

The 7-oz. units are said to be "ideal" for driving aircraft actuators, fans and blowers, and rapid-transfer switches.

The armature winding is described as completely symmetrical, providing "true electrical balance, superior commutation and low radio noise interference." Speeds range from 5,000 to 20,000 rpm. Units for 6 to 115 v. d.c. operation can be supplied. At a short-duty cycle, up to 65 mill-hp. is attainable for 26 v use.

Barber-Colman Co., Rockford, Ill.



Safe Gauge

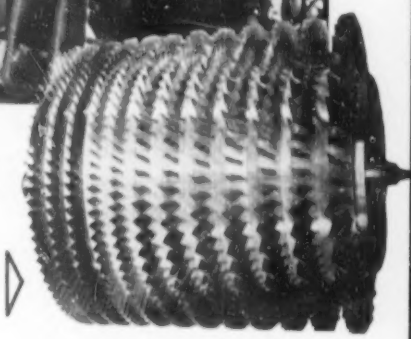
A pressure gauge said to combine protection to the viewer with easy access to entire movement and tube assembly as an aid to inspection, recalibration and repair is the Maxisafe Duragauge. The gauge has an integrally cast solid wall separating the dial from movement and tube. A double spring-mounted safety release plate, which permits the

AIRCRAFT
ENGINE BUILDERS
LOOK TO

EX-CELL-O

For Volume Machining of Jet Blades

A production department for machining the airfoil form of jet engine blades



Finished jet engine compressor rotor

A complete line of automatic blade finishing machines, designed and perfected at Ex-Cell-O, turns out large volumes of jet blades to the specifications of engine builders. In addition, Ex-Cell-O, through its subsidiary, Robbins Engineering Company, machines rotor wheels, inserts the blades, and assembles the complete rotors.

Plant facilities have been expanded and added employees have been trained in the machining and inspection of these precision parts and assemblies.

As one of the world's largest producers of precision parts for aircraft engines, Ex-Cell-O can help you eliminate bottlenecks and meet production schedules. For information or a quotation on your precision parts, contact Ex-Cell-O in Detroit.

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Experience is the most reliable teacher . . . and Sensenich, as the largest manufacturer of light aircraft propellers, has more designing, more engineering and more production experience than any other manufacturer. Performance dictates Sensenich propellers . . . and pilots prefer them!

METAL . . . Fixed Pitch CAA approved up to 125 hp.

WOOD . . . Fixed Pitch CAA approved up to 225 hp.

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Prompt repair service on all makes of wood propellers from Sensenich's PROP-SHOP.

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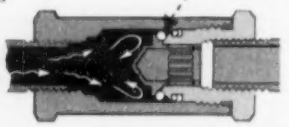
. . . Be sure by specifying "CIRCLE-SEAL" Valves - - -

The "Circle-Seal" principle affords perfect leakproof performance with inches of water or thousands of pounds differential . . . non-chattering action . . . cushioned closing . . . which prevents wear or damage to seats



The ultimate answer to check valve requirements from very low pressure to 3,000 psi.

CIRCLE SEAL

PRECISION CHECK VALVES
LOW PRESSURE RELIEF VALVES
SHUTTLE VALVES
FLOW LIMITER VALVES

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• Many dealers offer lower prices on quantity purchases.

South Carolina— Midway between New York and Miami

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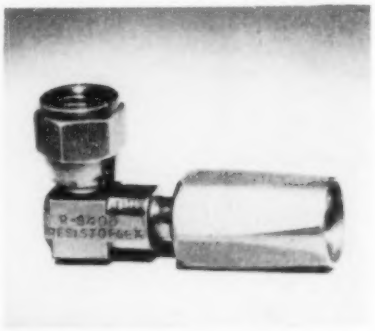
emergency discharge of pressure media away from the viewer, covers the back of the case. Less than ½ psi. pressure forces open the plate, the manufacturer says.

The Maxisafe line includes gauges for pressures up to 100,000 psi.

Manning, Maxwell & Moore, Inc., Stratford, Conn.



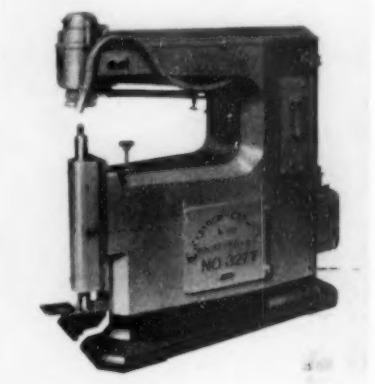
Aircraft Hose Fittings

Carbon steel elbow fittings for aircraft hose—designed to make installations more compact at turns and bends—are being produced by Resistoflex Corp.

The 45- and 90-deg. elbows are being used in gun charger systems, pilot ejector seat actuators, jet engines and other close-quarter airframe locations, the manufacturer says.

The fittings have swivel nuts for use with ¼- and ⅜-in. MIL-H-5511 hose. Internal angle passages are made by intersecting drill holes in the machined, one-piece body of the unit. No brazing or welded joints are used, and angle adaptors are not needed for fitting the part to hose. Straight adaptors provide an installation of minimum bulk.

Resistoflex Corp., Belleville 9, N. J.



Trim Router

A new trim routing machine has been developed by Ekstrom, Carlson & Co. for cutting large and awkward non-ferrous aircraft sections.

The Ekstrom, Carlson No. 327-T

'S' Monel...

an extra-hard casting alloy that resists galling and seizing at high temperatures

Takes the brunt of dry starts. Shown here fully assembled is the bearing cage for a jet engine turbine shaft. This bearing runs dry during the first moments of starting, causing a galling problem for the retaining ring. This retaining ring (arrow) between the inner and outer races is a centrifugal sand casting of "S" Monel, cast by Inco. "S" Monel not only offers a high degree of resistance to galling, but also retains its hardness at temperatures up to 1,000° F.

Whenever you're looking for hardness in a corrosion-resisting metal, it's a good idea to review the characteristics of "S"® Monel.

"S" Monel is one of the hardest and strongest of the non-ferrous alloys available in cast forms. What's more, it combines the inherent corrosion resistance of Monel with two particularly valuable features: 1) *extra* hardness at high temperatures, and 2) resistance to *galling and seizing*.

"S" Monel, in fact, maintains a hardness nearly as great as heat treated steel. Temperatures reaching as high as 1,000° F have but slight effect on its hardness.

There have been instances where "S" Monel has shown unusual resistance to seizing, despite poor lubrication – or no lubrication at all!

Another property of "S" Monel is that it is non-magnetic and stays that way at all temperatures down to —70° F.

It is this combination of exceptional properties – and the ability to retain them at high temperatures – that make "S" Monel especially useful for cast precision parts that can be counted on to –

- **take the brunt of high heat**
- **maintain accurate alignment or tight fit**
- **resist galling and seizing**
- **retain their resistance to corrosion, erosion and wear**

You'll find further information on "S" Monel in our bulletin, *Inco Standard Alloys for Special Problems*. Your copy is ready and waiting. Write for it now. And consult your distributor of Inco Nickel Alloys for the latest information on their availability from warehouse and mill. Remember, too—it always helps to anticipate your requirements well in advance.

The International Nickel Company, Inc., 67 Wall Street, New York 5, N. Y.

Mechanical Properties of "S" Monel*
(Age-hardened)

Yield Point	80-115,000 psi
Tensile Strength	120-145,000 psi
Elongation in 2-in.	4-1%
Hardness (Brinell)	300-375
Coefficient of Thermal Expansion (32°-212° F.) in. in °F.	.0000068

Hardness of "S" Monel at Elevated Temperatures*
(As-cast Condition)

Temperature, °F.	Brinell Hardness
Room	321
700	321
800	311
900	311
1000	321
1050	335
1100	293

Inco Nickel Alloys

MONEL® • "R"® MONEL • "K"® MONEL • "KR"® MONEL
INCONEL® • INCONEL "X"® • INCOLOY® • NIMONICS®
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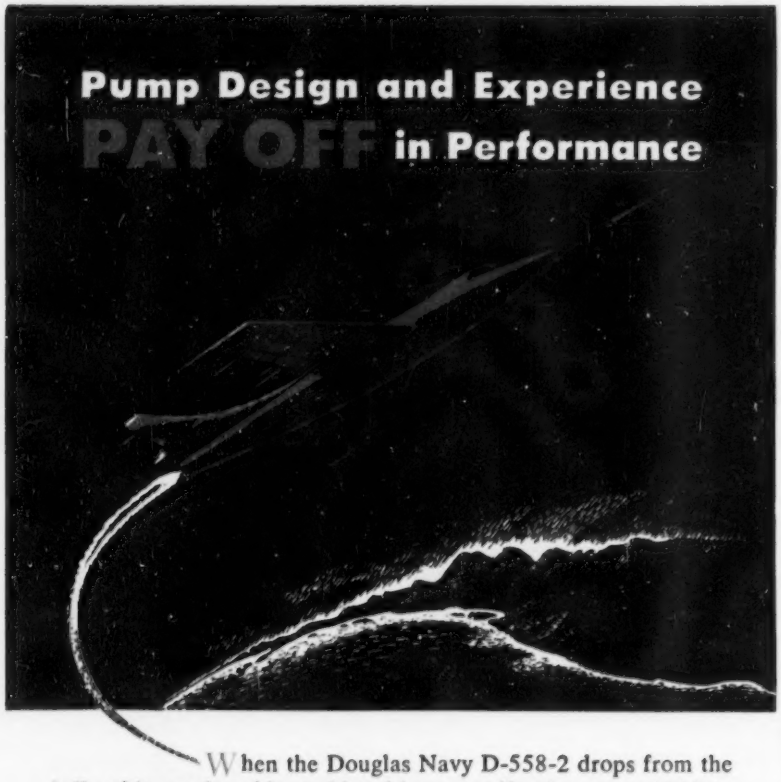
INCO



When the Douglas Navy D-558-2 drops from the belly of its mother ship, turbine driven centrifugal pumps whirl into the herculean task of keeping the four ravenous rocket engines supplied with fuel. Both the fuel and liquid oxygen pumps are by Carter.

CARTER SERVES HERE, TOO

THE F-86-D SABRE. Streaking through the sub-stratosphere the world over, the North American F-86-D Sabre gets a big power boost through the use of an after-burner. The performance and agility of this fighter hinges on the ability of a tiny 4-lb. pump to deliver a large volume of fuel under very high pressure. A Carter designed pump does this job.

THE AERIAL GAS STATION. One of the successful answers to intercontinental flights is mid-air refueling. Carter designed and manufactured pumps assure the successful transfer of fuel from the Boeing Flying Boom tanker to many of today's aircraft.

Carter designed equipment is also in service on F-89 Scorpion, B-47 Stratojet, F7U Cutlass and F4D Skyray.

OTHER CARTER ACHIEVEMENTS

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machine has two spindle speeds, 10,000 and 20,000 rpm, and is driven by motors of 3, 5, or 7½ hp. Throat clearance is 27¾ in. Adjustable distance from the spindle face to guide-pin holder ranges from 3 to 9¾ in. Maximum stroke of the guide-pin holder is 6¼ in.

Ekstrom, Carlson & Co., 1400 Railroad Ave., Rockford, Ill.

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Longer-life welding helmets made of Fiberglas are said to be stronger and more durable than present types, yet lighter weight. United States Safety Service Co., 1215 McGee St., Kansas City, Mo.

Costs are cut with patented inspection device which integrates five tools for close dimensional checking of precision machined parts, according to developer. Setups are quicker and floor space is saved, says Swanson Tool & Machine Products, Inc., Erie, Pa.

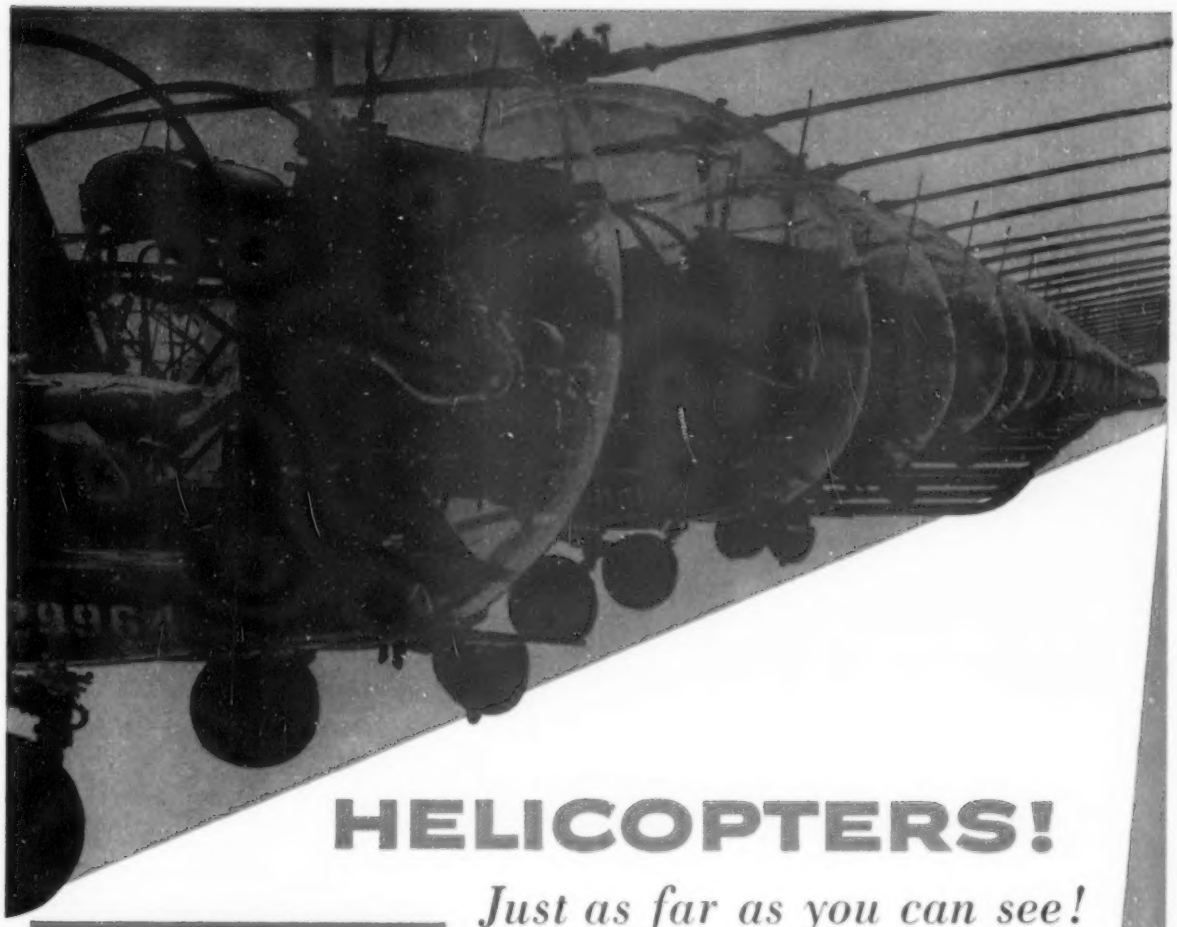
Small metallic bellows for airborne components can be used on control shafts to retain hermetic seal. It is designed to resist a wide temperature and pressure range and can be used on shafts as small as ¼ inch in diameter. Clifford Mfg. Co., Waltham, Mass.

Portable vacuum tester will test small fuel tanks, diaphragms, bellows, pneumatic valves and other aircraft parts. Adjustable for vacuum and time cycle, this low-cost system includes vacuum pump, testing plate and instrument panel—Gits Bros. Mfg. Co., 1866 S. Kilbourn Ave., Chicago.

Rulon plastic bearing material needs no lubricant, has high heat-resistance (400F) and low coefficient of friction; out-performs other metal and plastic bearing materials, according to maker—Dixon Lubricating Saddle Co., Bristol, R. I.

Shur-Stop accessory for Certi-Crimp hand tools improves crimping of terminals to wires conforming to Spec. MIL-W-5086, by preventing the thin-walled insulation from being inserted along with the wire in the terminal barrel—Aircraft-Marine Products, Inc., Harrisburg, Pa.

Punch press with slow, powerful stroke (extra-heavy stub-toothed back gears bring speed range down 40 to 100 strokes per minute) can be used for drawing, forming and other metal operations not generally done on this machine—Benchmaster Mfg. Co., 1835 Rosencrans Ave., Gardena, Calif.



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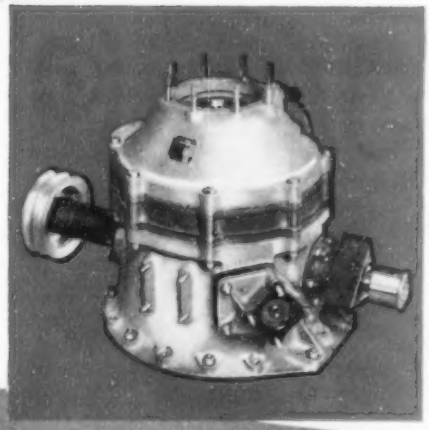

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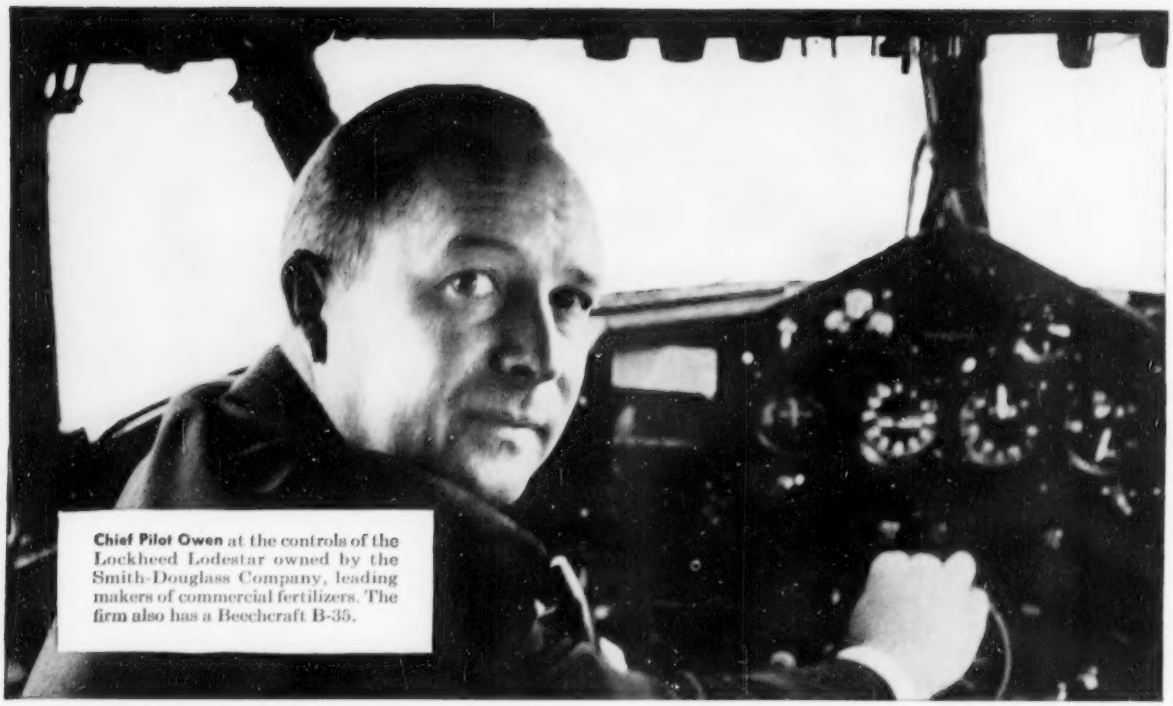

Chief Pilot Owen at the controls of the Lockheed Lodestar owned by the Smith-Douglass Company, leading makers of commercial fertilizers. The firm also has a Beechcraft B-35.

Ask the men with the most experience . . .

ask Clarence B. Owen, Jr.

Chief Pilot, Smith-Douglass Co., Inc., Norfolk, Va.

"With nine factories—scattered from Virginia and North Carolina to Louisiana, and up into Illinois—our company keeps its two planes mighty busy," says Mr. Owen, a pilot who's logged 6,500 hours in the last 14 years. "And *everywhere* we fly, we know we can count on Gulf for the same fine quality products and the same fine service. That consistent excellence is one of the big reasons why our company, for the last six years, has made it a point to 'Go Gulf.'"

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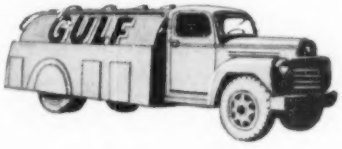

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FINANCIAL

Net, Sales Up for North American

Dividend rate rises to 75 cents a share as net after taxes hits $7.8 million on sales of $315 million.

Increased profitability of the aircraft industry as a whole last year is reflected in the annual report recently released by North American Aviation, Inc.

For the fiscal year ended Sept. 31, 1952, this major producer revealed total sales of more than $315.2 million, up some 78% from the 1951 fiscal year.

Net income after taxes reached $7.8 million, or $2.28 per share, a 21% increase over 1951 earnings of $6.4 million, or $1.87 per share.

▶**Below 1950 Income**—While fiscal 1952 sales were at a postwar peak, net income for the year was slightly below the 1950 net of almost $8.1 million, or $2.35 per share.

Net sales for the 1952 period were less than one-half of the $680-million record established during the war year, 1944, but higher than that for 1941 and 1942.

Like all annual aircraft reports of recent years, the North American statement gives considerable prominence to the impact of taxes on earnings. For example, the company revealed net 1952 earnings before taxes of $20.3 million. Provisions for federal income taxes took $12.5 million, or 61.5%. For 1951 the tax bite took about 58%; in 1950, 40%; and in 1949, only 37%.

Primarily as a result of the heavier tax imposts, net profit margin on sales for 1952 was down to a postwar low of 2.5%. This compared with 7.2% for 1948 and 3.6% for 1951. Net return on the average net worth for 1952 was down to 14.1% as compared with 17.2% for 1950.

▶**Dividend Increased**—While annual dividends aggregating almost $4.3 million, or $1.25 per share on the 3,435,033 shares outstanding, remained unchanged for the three-year period ended Sept. 30, 1952, an increase for the current fiscal period has now been effected. A dividend of 75 cents per share was paid in December 1952, as compared with a dividend of 50 cents paid a year earlier.

It is significant that, of the $36.4 million in net earnings accumulated during the five-year period ended Sept. 30, 1952, only $18 million, or less than one-half, has been paid out in the form of dividends, the balance being reinvested in the enterprise.

Much of the retained earnings has been ploughed back into plant and facilities. For example, at Sept. 30, 1947, the company showed a property, plant, and equipment account with a net book value of $1.7 million. Five years later, at Sept. 30, 1952, this account had increased $15.3 million to a total of $17 million.

During fiscal 1952, gross capital expenditures amounted to $7.4 million. Additions to facilities and equipment consisted principally of new manufacturing buildings at the Los Angeles plant site and new machinery and equipment. Depreciation of $2,744,702 was provided and the net book value of property, plant, and equipment increased by $4,653,316. Of the gross capital expenditures, approximately $2.8 million was covered by certificates of necessity permitting accelerated depreciation over a five-year period.

To finance its expanding volume of operations, the company increased its borrowings from commercial banks under short-term notes. At Sept. 30, 1952, such loans stood at $51.5 million, but were increased to $60.5 million at Dec. 31, 1952.

▶**Huge Operation**—An indication of the magnitude of North American operations can be seen from a brief analysis of its current account.

For example, work-in-progress inventories, on which title was held by the government, amounted to about $282.7 million on which a progress payment of $216.4 million was received, leaving $66.3 million in the company's current assets Sept. 30, 1952.

In addition, more than $52.6 million was represented as accounts receivable due from the government as of the same date. With these and other elements, net working capital stood at $40.4 million at the last fiscal year-end.

Net worth had increased to $57.4 million, or $16.72 per share at Sept. 30, 1952, up from $53.9 million, or $15.69 per share a year earlier.

At Sept. 30, 1952, orders amounted to slightly more than $1 billion. Together with business aggregating $307 million in the process of negotiation, total backlog was estimated at $1,321 million.

In viewing the future, North American's management expresses the belief that under present schedules, "a further increase in sales may be expected during the next two fiscal years. The amount of increase in earnings will depend to a considerable extent upon tax policies."

This optimistic outlook has since been borne out by the results of the first quarter of the company's present fiscal year. For the quarter ended Dec. 31, 1952, North American revealed sales of $102.8 million and net income, after taxes, of $2.4 million, or $0.70 per share. This compares with sales of $52.7 million and net income of $1,575,000, or $0.46 per share, for the same 1951 quarter.

▶**Research Program**—Not appearing in any of the balance-sheet and income details but of underlying importance to the company's past and future financial success is the vast scale of pioneering research and development constantly being pursued.

Of its 45,440 employes, last reports indicated more than 4,500 were engaged in its airplane engineering groups and more than 4,200 in its engineering and research projects, involving missile-control equipment and the use of atomic energy.

The annual report succinctly states the "company's future business and the nation's future security are now being shaped by the thousands of engineers and scientists who are exploring new frontiers of aerodynamics, structures, controls, propulsion, electronics, and even atomic-energy applications. . . . Airplane design is still the biggest part of the total job. But guided-missile activity is growing rapidly, as are projects involving control equipment and rocket propulsion. As the basic research in new fields moves forward, new applications, both commercial and military, suggest themselves."

▶**Advanced Facilities**—The company further notes that it "has built and is now utilizing some of the most advanced facilities operated by industry, ranging from supersonic windtunnels to gigantic rocket testing stands.

This description of the research activities being conducted by North American particularly emphasizes the importance which is attributed to guided missiles and the various fields of electronics.

In all this activity, management clearly recognizes a responsibility to make substantial expenditures of company funds and time in the interest of the national welfare. While this policy may appear restrictive to current earnings, stockholders in the long run should be the beneficiaries through the company's ability to develop and produce items required by the military services.

Management sums all this up with this observation: "The key to the future is ability to stay ahead in the never-ending technical race."

—Selig Altschul

ACC Faces Tough Civil-Military Decisions

- **Air transport production priorities on agenda.**
- **Early answers by mixed membership unlikely.**

Air Coordinating Committee, executive agency working to unify U. S. civil and miltary aviation policy, will face a tough agenda late this week at its first meeting under President Eisenhower's Administration.

Representatives of the member agencies, including three new Eisenhower appointees, face the following problems pressing for early decision:

• **Air Force-municipal fight** over joint use of Chicago's new O'Hare Airport and Galveston's Municipal Airport. Both ACC and former President Truman found this one too hot to handle. Truman recommended that Air Force keep its jet intercept units at O'Hare but "investigate" sites for a "satisfactory" alternate location. Galveston is a new problem, with civil users claiming the traffic area is too saturated to take an Air Force jet intercept unit. Congress has told the Air Force during the past two years to save money by re-activating some of the bases transferred to state and municipal operation after World War II, with revocable leases.

• **TV broadcaster-CAA fight** on proposals to put new 1,500-ft. ultra-high-frequency television transmitter antennas in or near federal airways. The ACC subcommittee on airspace use has recommended denial of about 30 TV broadcasters' construction proposals as a menace to air-traffic safety. Federal Communications Commission has gone along with the ACC subcommittee recommendations to date.

• **Production priorities** for new airline transports after the Defense Production Act expires this June. ACC previously has recommended and received approval for equal defense materials and component parts priority for production of civil and military heavy transports and federal airways avionics.

Civil transports received equal priority with military because they are an active military reserve. Airline-Air Force contracts provide new airliners be modified for 48-hr. mobilization by Military Air Transport Service. These planes are on the same production lines as military transports.

Priority Civil Aircraft Production

(Approved to date by Air Coordinating Committee and Defense Production Administration)

Airliners		Non-transport	
1951	115	1951	2,500
1952	221	1952	3,197
1953	222	1953	4,631
1954	180	1954	5,198
1955 (1st quarter)	8	1953 (1st 2 qtrs.)	2,480
Total	**746**	**Total**	**18,006**
Transport Types		**Transport Buyers**	
Twin-engine	430	U. S.	574
Four-engine	316	Foreign	172

Note: Actual non-transport production has not equalled maximum volume allotted by priority.

Source: Air Coordinating Committee annual report for 1952.

• **Priorities recommendation** by ACC expected on heavy civil transports and federal airways. Assuming such decision, ACC may require individual justifications of new orders by claimant agencies. One potential controversy may arise from a Civil Aeronautics Administration recommendation of priority for 2 DC-6Bs ordered by North American Airlines, largest nonsked operation. Civil Aeronautics Board chairman Oswald Ryan may object but CAB's position was not decided early last week. An ACC majority is expected to reason that one DC-6B in competent, useful operation is as good a military reserve as another. Corporation orders for executive versions of airliners have been recommended similarly for priority by CAA and approved by ACC and Defense Production Administration in the last two years.

• **U. S. customs streamlining** recommended for ACC approval by its "facilitations subcommittee," in line with a concerted drive by the U. N. International Civil Aviation Organization to simplify international air trade and travel.

• **Air navigation standardization,** a dispute between Navy, Air Force and civil users, up for ACC resolution soon. This security-classified dispute dissolved the Navigation Committee of Defense Department's Research and Development Board two years ago and nearly caused disbanding of the Air Navigation Development Board.

• **Runway approach clearance** from obstructions by federal zoning, as recommended by President Truman's (Doolittle) Airport Commission. It conflicts with states' rights and municipal zoning powers. ACC may ask President Eisenhower to urge clarifying legislation.

▶ **ACC Bottleneck**—Action on these controversial items may be slowed at the first few committee meetings under the Eisenhower Administration. Here are the reasons:

• ACC has no Air Force member yet because of the withdrawal of R. C. Sprague's nomination for the undersecretaryship.

• Three other committee members will be newcomers to aviation and ACC.

• Remaining members are appointees of the Truman Administration and may not carry their former degree of power to commit their departments or agencies on controversial items of the ACC agenda over the next month or so.

▶ **ACC Committee Members**—New ACC members are: Treasury Undersecretary H. Chapman Rose, Commerce Undersecretary for Transportation Robert B. Murray, and Assistant Postmaster General John C. Allen. The experienced pre-November members are J. Paul Barringer, State Department Director of Transport and Communications; Army Undersecretary Earl D. Johnson; Navy Assistant Secretary John Floberg; Milton M. Turner, Air Force (alternate ACC member) Deputy for Civil Aviation, CAB's Ryan and J. Weldon Jones, Budget Bureau (non-voting but powerful ACC member) Deputy Director. Status of the non-voting National Security Resources Board is tenuous, because a recent "reduction in force" has about wiped out that agency.

▶ **ACC Powers**—The ACC members,

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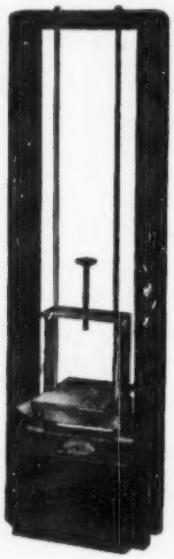

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Tax Writeoffs

Latest airline capital expenditures approved for five-year tax writeoff by Commerce Department, Air Coordinating Committee and Defense Production Administration are as follows:

	Items	Value
Eastern	Parts	$2,027,993
Capital	7 L-749	6,763,568
Delta	4 DC-7	7,500,000
United	25 DC-7	56,768,049
Flying Tiger..	7 DC-6A	9,100,000
Total	**43 Planes**	**$82,159,610**
Cumulative total certified to date....	340 Planes	$350,000,000

representing their agencies, each have the power of veto. When such occasional deadlocks occur, the matter goes to the President. ACC was set up in 1945 by agreement of War (later Air Force) Navy, State and Commerce Departments, and has since been joined by CAB and Army.

Policy questions go to ACC from federal departments, states, municipalities, industry and the U. S. representative to ICAO. The committee refers questions to the appropriate subcommittee or panel for study and preparation of a position. Industry and government often participate in the study. If the matter is more than routine correlation of inter-agency information or contradictions, it goes to the full committee for approval.

▶ **ACC Budget Survival**—At the meeting this week, ACC executive secretary Charles O. Cary will submit a revised 1954 budget for committee approval. Airmail ACC costs run $160,000: $140,000 salary, $19,000 office and printing expense, and $1,000 travel. ACC justifies this expense on its function of eliminating aviation policy duplication or contradiction, with attendant waste, confusion and time loss in some important military and civil development programs and operations.

The ACC budget approved by the full committee then goes to the Budget Bureau. Presumably, ACC member J. Weldon Jones, assistant director of the Budget Bureau, will urge Director Joseph Dodge to approve this budget.

ACC Policy Group to Study Convertiplane

A federal policy to coordinate development of convertiplanes for civil transport and military uses is the aim of a new working group which has been set up by the Air Coordinating Committee.

The convertiplane is a heavier-than-

air craft combining an airplane's conventional cruising flight characteristics with a helicopter's ability to operate from small ground clearings. Several convertiplane designs are under military contract and are nearing flight status.

The ACC, which coordinates policies of military and civil agencies, says its convertiplane working group will recommend a policy for approval of the full committee of representatives of all interested agencies. The working group will study "developments in the convertiplane field during the past few years, contributions such aircraft can potentially make to the national defense, and their use in the civilian economy," a spokesman says.

An ACC group won inter-agency approval of a helicopter development and promotion policy two years ago. ACC says it is setting up the new convertiplane group "in response to industry and government interest. . . ."

Chairman of the group is Col. W. B. Bunker, Army, with Lt. Col. R. L. Long, also Army, as alternate chairman. Other members are Maj. R. J. Wellman, USAF; R. S. Knecht, Navy; E. B. Miller, Civil Aeronautics Board; and R. K. Waldo, Commerce Department. Waldo was chairman of the ACC helicopter working group.

Atlantic Cargo Case Hearings Open Mar. 3

Civil Aeronautics Board Examiner Herbert K. Bryan will start hearings Mar. 3 on six nonsked applications in the reopened trans-Atlantic Cargo Case. The applicants seek nonsubsidized airfreight certificates to Europe and the Middle East, competitive with Pan American and TWA.

Original applicants in the case are Transocean and Seaboard & Western, who previously were denied certificates on grounds no specialized cargo service was needed. However, the Board was later forced to reopen the case, because CAB had neglected a Defense Department letter strongly supporting certification of a trans-Atlantic cargo service. The Board also found that foreign carriers appeared to be headed toward domination of trans-Atlantic cargo.

Former President Truman consolidated a later application of European-American Airlines in the reopened case, after CAB had denied EAA's application in the trans-Atlantic route renewal case of TWA and Pan American. The Board then opened the case for complete rehearing, with these new applicants: Flying Tiger Line, Trans-Caribbean and Overseas National. CAB denied a request of Flying Tiger to broaden its application to include Los Angeles-Europe service via Salt Lake City, Winnipeg and Greenland.

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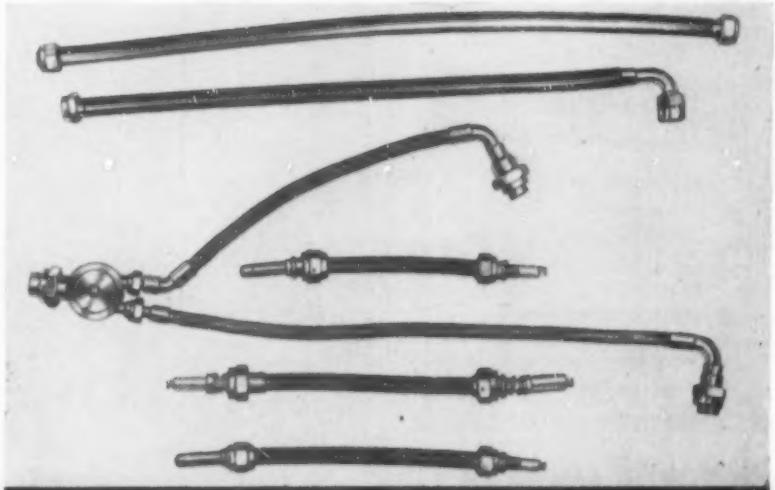

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SHORTLINES

► **Air Line Pilots Assn.** plans to ask CAB to revise its investigation report finding "pilot error" the main cause of the fatal Northwest DC-4 crash at Sandspit, B. C., if it succeeds in getting the Board to revise a similar finding on the fatal Pan American DC-4 crash off San Juan. The CAB reports note several technical failures of equipment and maintenance but fix final blame on the pilot.

► **Air Materiel Command** may offer 30 C-46s for airline lease as freighters.

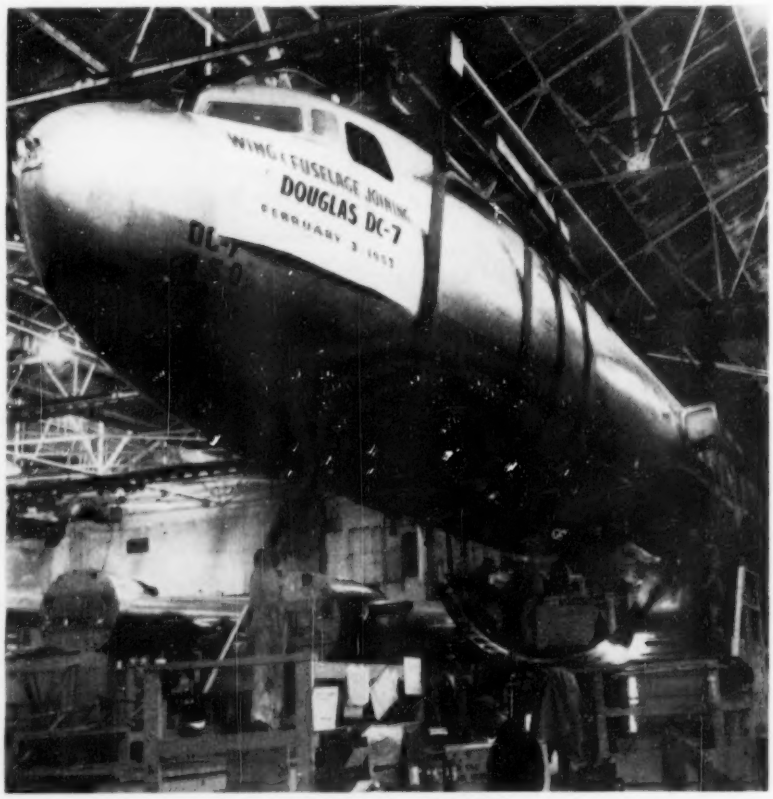
► **Air Transport Associates, Inc.**, non-sked of Amos Heacock facing CAB revocation, is closing sales offices, anticipating Supreme Court refusal to review the case. ATA can fly military charter only, if letter is revoked.

► **Allegheny Airlines** has a new CAB certificate, with routes transferred from its former All-American Airways certificate, now rescinded.

► **Braniff Airways'** challenge of the 53-cent final ton-mile mail rate set by CAB, effective since the BNF merger with Mid-Continent Nov. 10, starts a new mail-rate case for the period from that date. CAB dispute with Post Office on proper rate for period Oct. 1, 1951, to Nov. 9, 1952, continues. Post Office wants to require Braniff to set up an "earnings equalization reserve" on the theory that it is a cushion against possible reverses that might require payment of a higher rate.

► **Canadian Pacific Airlines** will start jet Comet service Sydney-Honolulu Apr. 28. CPA will use DC-6Bs from Honolulu to Vancouver until 1954, when it plans to span this long hop with the Mark II Comet.

► **Miami International Airport** has published an air shippers' handbook quoting rates and routes to most major points in U. S. and Latin America from Miami.



DC-7 NEARS FLIGHT

Douglas DC-7 is shown getting its wings in the first actual photograph of the new four-engine airliner. Described as the "world's fastest piston-powered transport," the DC-7 will have an average cruising speed of 360 mph. and a top speed of more than 400 mph. It is the first airliner constructed from large quantities of titanium metal. The transport is more than eight feet longer than the DC-6 and will seat from 60 to 95 passengers. Douglas reports 58 DC-7s already have been ordered.

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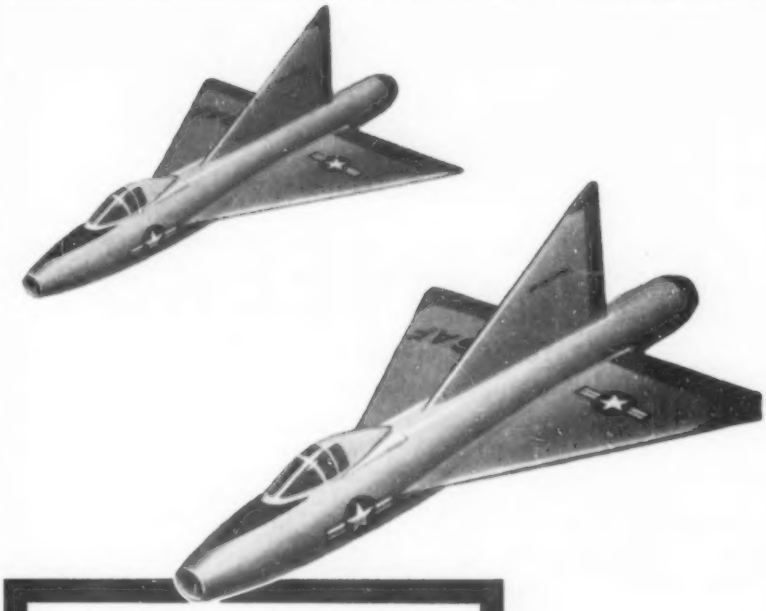

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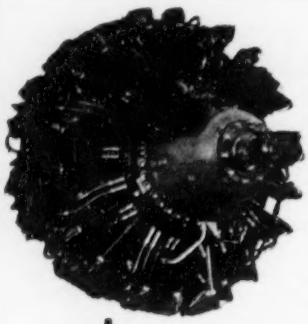

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411	-C5	121	-C14A	210	-C30
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Pilots and Those AF Crashes

The winter's crop of USAF disasters started speculation on what was wrong, safety-wise, with military aviation. A congressional investigation, a probe by a committee of generals and considerable public discussion indicated that worthwhile steps would be taken towards a cure. As yet, however, only some immediate causes—such as a poor gust lock and inadequate radio facilities—have been mentioned.

While these factors undoubtedly need attention they cannot be considered basic causes or part of an overall pattern. The congressional investigation hinted momentarily at pilot qualifications but the subject was not pursued. In fact, press releases from the Pentagon spoke highly of veteran military pilots of 10 years and 2,500 hr. experience. This is the basic pattern which has escaped attention.

► **Depends on the Job**—Before exploring this thought, it should be mentioned that the Air Force has every right to brag about its pilots. Any 2,500-hr. pilot who can take a large four-engine plane across the Pacific, or even fly around in the states in winter weather, deserves an award—but he shouldn't be allowed to try it again.

A 2,500-hr. pilot may or may not be well qualified. It depends on the job. That length of time around the local airport would produce a good lightplane pilot. In fact, 2,500 hr. on almost any single-engine ship is good. As we go up the scale to four-engine equipment, however, 2,500 hr. becomes less impressive. According to airline standards, that amount of time on a DC-6 or Constellation would be but an introduction to the plane. For instance, the least-experienced junior captain on my own airline has more than 6,000 hr., and the average time of our pilots flying the Pacific airlift is 12,000, with 15,000 and 20,000 hr. not uncommon.

► **Fewer Hours for Copilots**—The pilots in command of the ill-fated Air Force planes have TOTAL flying times of about 2,500 hr. Service on individual types of equipment was around 400 hr. Little mention is made of the copilots in these cases, but it is to be assumed that they had less experience, and if this is true they obviously were of little help.

The phrase "10 years' experience" likewise can be misleading. Many a golf addict has played for 10 years only to remain deep in the duffer class because of weekend practice only. Aviation has a similar group—the "weekend warrior." As with other things, a decade of occasional aviation practice is no measure of proficiency and cannot compete with a year or two of constant, everyday experience.

► **Major Occupation**—While it may be necessary for military men to spend part of their time on administrative desk jobs, it also is true that command of an airplane like the C-124, carrying more than a hundred lives, is a major occupation. This job should not be considered as merely one step in a man's career, to be accomplished when time permits, but rather as a command which requires years of preparation.

There is no question that these 2,500-hr. pilots have performed heroic deeds—but neither is there much doubt that their qualifications were fantastically inadequate for the job they were asked to do. This does not mean that all military pilots need to be in the 10,000-hr. class or that weather flying restrictions are necessary. But carrying women and children, litter patients and soldiers home for Christmas furlough is just as close to an airline operation as it is possible to get and therefore requires approximately the equivalent in standards.

The Air Force has many well-qualified 10,000-15,000-hr. pilots, many with airline experience, but too many of them are at desk jobs. If for some reason these men cannot be used as active pilots, the Air Force should restrict itself to non-airline operations.

WHO'S WHERE

(Continued from page 11)

is now general works superintendent for Avro Canada, Malton, Ont.

Joe Horton has been appointed plant superintendent of Pastushin Aviation Corp., Los Angeles.

British Air Vice-Marshal A. C. H. Sharp has joined Sun Electric Corp., Washington, D. C., as assistant director of the Military Division.

Cy Fenn has been named chief engineer-mechanical of Edo Corp., College Point, N. Y.

Walter H. Henry has been appointed manager of the recently organized marketing department of General Electric's Motor and Generator Division, Schenectady, N. Y. Also named to head new departments are **Olaf F. Vea**, general manager induction motor; **Oscar L. Dunn**, manager direct current motor and generator planning study, and **Fred B. Hornby**, general manager synchronous and specialty motor and generator department. In GE's Pittsfield, Mass., plant, **Harold M. Patterson** has been named manager of engineering of the Chemical Division's plastics department.

William F. Gerety has been appointed director of purchasing for Kaman Aircraft, Windsor Locks, Conn.

John H. Keebler is National Airlines' new director of catering and cabin service.

C. F. Herbold has been named industrial relations director at Jack and Heintz, Inc., Cleveland.

Boone T. Guyton has been appointed manager of government sales and service for Norden Instruments, Inc., Milford, Conn.

Wendell S. Walker has been appointed engineering office manager of Engineering and Research Corp., Riverdale, Md.

Jack O. Coffey has been named aircraft sales manager of the South Wind Division, Stewart-Warner Corp., Chicago.

Hobart E. Switzer has been appointed purchasing agent of Electric Regulator Corp., Norwalk, Conn.

Everett E. Pursley has joined Borg-Warner Corp., Muncie, Ind., as training director of the Warner Gear Division.

Charles T. Laechelt has been appointed purchasing agent for Taco West Corp., Chicago. Other appointments: **Ardmore M. Miller**, assistant sales manager; **Edward O. Marquardt**, chief mechanical engineer, and **Charles B. Karch**, production manager.

Honors and Elections

Rep. Carl D. Hinshaw has been elected president of the Aero Club of Southern California, affiliated with the National Aeronautic Assn.

Dr. Martin A. Edwards, engineering manager of GE's Milwaukee, Wis., X-Ray department, has received his 88th patent, granted on a new type of fuel regulating apparatus for aircraft gas turbine engines.

George H. Buchner of Northrop Aircraft, Inc., Hawthorne, Calif., has been elected chairman of the Aircraft Industries Assn.'s spare parts committee.

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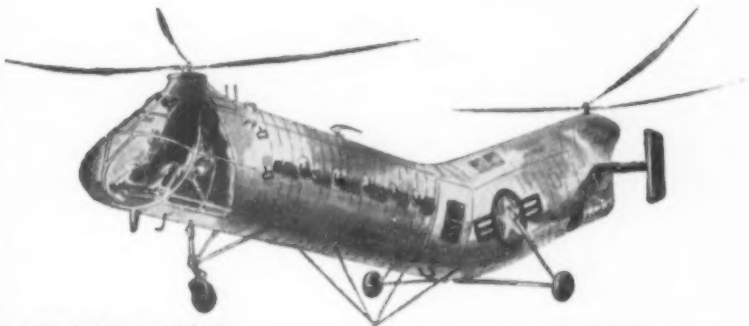

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EDITORIAL

How a Business Press Can Serve Its Industry

The aircraft and air transport industries and their individual companies spend hundreds of thousands of dollars every year on their public and press relations departments. Such a major expenditure is an accurate gauge of the importance they attach to proper public information.

A business magazine press that is aggressive, enterprising and truthful can be a powerful ally of any industry, and usually is. But, strangely, the role of an industry or business magazine is frequently misunderstood or its potent power for good is underestimated by the very people it helps or could help best.

The most obvious role of the business magazine, of course, is to report the significant economic, technical and political developments without fear or favor. This objective is more often difficult than easy to attain, and the background of AVIATION WEEK's lead story in its Feb. 9 issue is a case in point. The result, however, was a better informed public and industry, because two companies and their loyal employes were able to tell the world about their latest fighting planes.

We asked our executive editor, Robert Hotz—who also heads up our Washington staff—to send us an informal play-by-play report of how the first authentic and officially released story on the Douglas Skyknight (F3D) Marine night fighter and its combat victories got into newspapers all over the world.

Here is Mr. Hotz's memo detailing the work and time involved in turning out a story you probably read in five minutes:

"First tip came from Navy BuAer, where I was shown an unclassified dispatch from Korea stating that F3D night fighters had destroyed two Russian-built jets at night over MiG-Alley. Began checking USAF, Marines and Douglas for data on the rapidly growing night actions. USAF cooperated with details on B-29 night losses to Red fighters.

"Marines admitted first dispatch from VMF-513 Marine night fighter squadron in Korea had come in unclassified but said a dispatch several days later ordered a stop on it for security reasons. Second dispatch was classified secret so it wasn't distributed to recipients of first dispatch.

"Douglas public relations people told me they had been working for months to get the Skyknight story cleared, with no success. Marine headquarters said they felt story should be cleared now since first action had been in November, but Fifth Air Force in Seoul, under which VMF-513 operated, was suppressing story.

"I went to USAF Headquarters in Pentagon with queries if night fighters being used to escort B-29s in North Korea; if so, what types used and had they destroyed any Red night fighters?

"Reply from Fifth at Seoul said night fighter story was being held up by Marines and Fifth had no objections to publication.

"Showed this to Marines and asked who was kidding who? On same day Naval Aviation News' unrestricted edition appeared with mention of two F3D Marine Red night fighter kills in Korea. I told the Marines, USAF and Douglas there appeared to be no legitimate security restriction on story since both Marines and USAF agreed and I intended to publish story in our next edition Feb. 9.

"Gave copy of my story to Marines and requested them to let me know before Feb. 3 if there were any details involving security. On Feb. 3 Marines asked me to delay story for a week. I emphasized prior publication of F3D story in Naval Aviation News and fact that briefing officer in weekly Pentagon press briefing on Korea had mentioned F3D shooting down a Red fighter on night escort of B-29. Fortunately, none of the correspondents attending tumbled to the tip but that was just lucky.

"So Marines cabled VMF-513 in Korea on Feb. 4 and a few days before my story could appear—while it was on the press—they released the F3D story in Korea. Reason for 'scooping' Aviation Week was given as 'in the interest of maintaining good press relations in Tokyo.' AP and other wire services wrote story on F3D in action that appeared state-side papers on Thursday, Feb. 5, and Feb. 6.

"Then USAF hurriedly rushed out release on fact that its Lockheed F-94B night fighters were also in action in Korea, thus taking some headlines from Marines. This was a story Lockheed public relations had been trying to break loose for some time.

"Our story appeared Feb. 9 with first real details on the aerial night battle of MiG Alley, including names of pilots and radar operators who made the kills.

"This is just another example of how military security regulations are abused by military authorities to accomplish purposes other than maintaining legitimate military security.

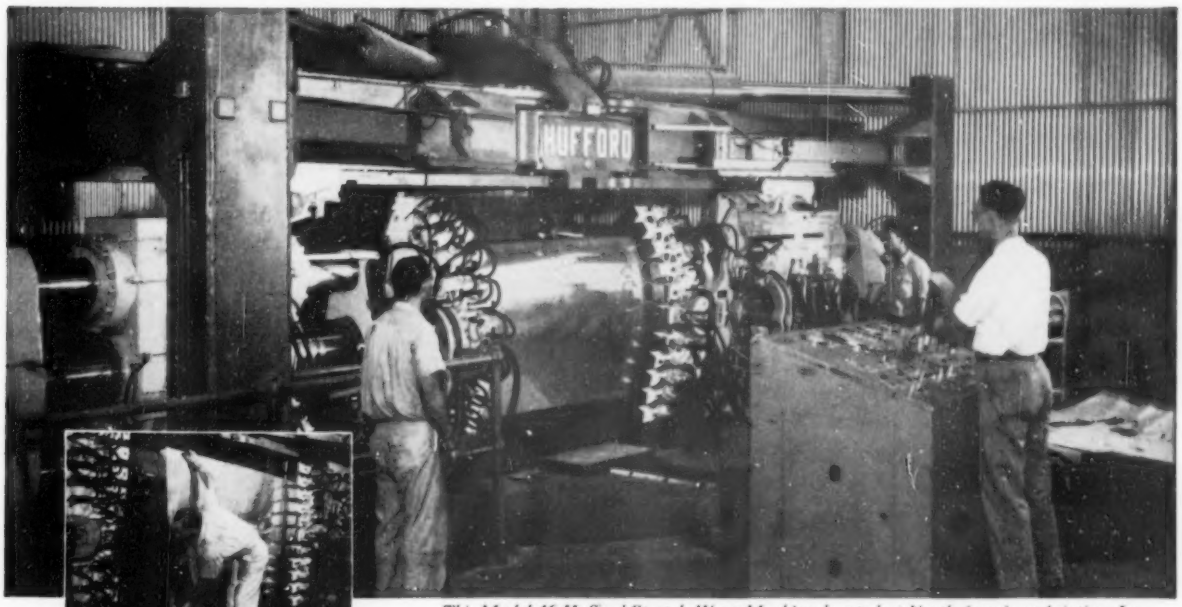
"Defense Department Information Director Andrew Berding, a former AP correspondent who should know better, recently blandly stated that henceforth there would be no such thing as an 'exclusive' story on military matters. If a correspondent's query uncovered a good story, he said the military would make the answers available to everybody. It is quite evident that the military is practicing what Berding preaches and Pentagon correspondents are being forced to handle competitive stories outside normal information and security review channels or have them handed on a platter to their competitors."

There is still a minority opinion in aviation, although it is diminishing through the months, that the business press serves best that depends most on "official" press releases, company and government handouts. The story above presents just one dramatic example among scores of how a powerful business paper of integrity can perform a public information service for industry that industry itself cannot perform alone.

—Robert H. Wood

Newest NEWS in Aircraft Manufacture

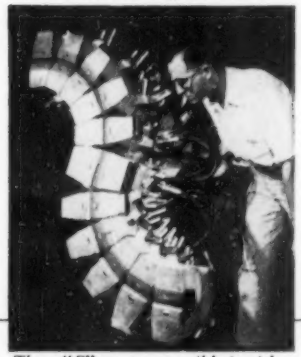
the Hufford HYDRA-CURVE sheet jaws



This Model 46 Hufford Stretch-Wrap Machine, located at North American Aviation, Inc., Inglewood, California, shows the new Hufford Hydra-Curve Jaws pre-shaping the sheet to match the vertical die contour. The arms wrap back to produce finished parts.

Jaws assume a straight vertical line for easy loading. Jaw positions, straight or curved, are made from the operator's control pedestal.

Note the extreme curvature possible with the new Hufford Jaws.



These "S" curves, possible in either direction, show the flexibility of the Hufford Hydra-Curve Jaws.

They ease forming problems, cut material costs, reduce sheet losses through breakage.

Here's the newest step in aircraft manufacture—another "FIRST" for Hufford, *pioneers and developers of the famous stretch-wrap forming process!*

THE NEW HUFFORD HYDRA-CURVE JAWS ease the forming of metal skins which are an important structural part of each plane. Used on the huge Hufford stretch-wrap forming machines, these new jaws are loaded in a straight, upright position—*but look what happens when the jaws begin to function!*

Out of the many possible curvatures the jaws can assume, sheets are easily pre-curved to match the cross sectional contours of the die. Stretching and wrapping around the die then completes the forming of the finished part.

ADVANTAGES? Yes . . . *Big* savings in material costs; better, faster forming; lower transitional area stresses and a minimum of losses resulting from sheet breakage!

These new curvable jaws again prove that *Stretch-Wrap Forming at its best comes FIRST from Hufford!*

All photos courtesy North American Aviation, Inc.

HUFFORD
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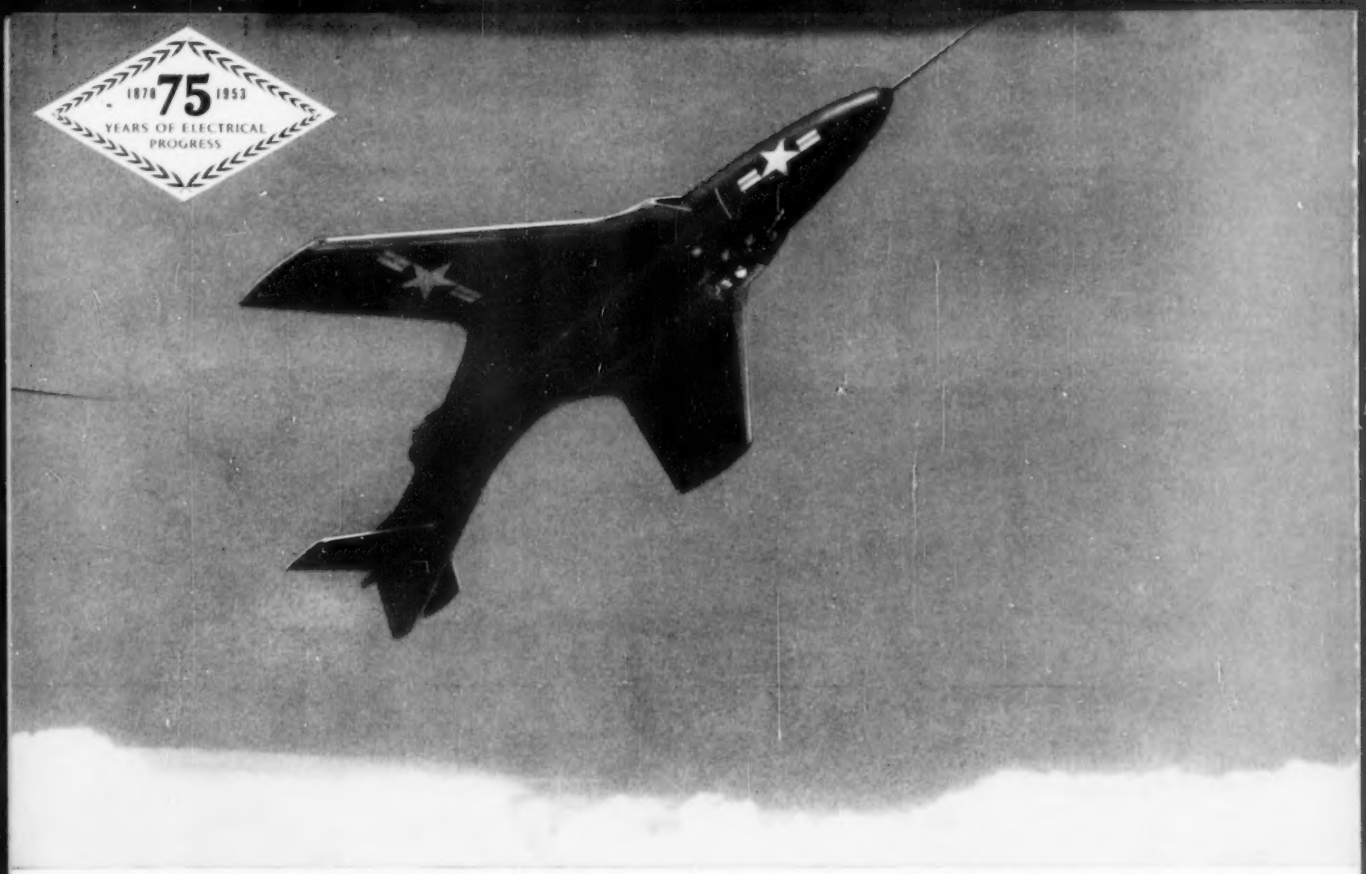

With General Electric G-3 flight control, pilot can automatically level off, at high altitude, from a roll maneuver like that shown above (Grumman F9F-6 Cougar). Pilot pushes G-3 "level" button when plane reaches ±65° attitude, plane will assume level flight.

New advances in autopilots for Navy jets

General Electric G-3 flight control aids jet performance six ways... is slated for Navy's new carrier jet, McDonnell F3H "Demon"

Designed specifically for high-speed jet aircraft, General Electric's G-3 autopilot is now installed in Douglas F3D-2 Skyknights, Grumman F9F-5P Panthers, and the new swept-wing Grumman F9F-6P Cougar. A G-3 autopilot will soon go into the Navy's newest carrier jet—the McDonnell F3H "Demon."

Purpose? The G-3 gives *specialized* aid to a plane's flight performance; performs such jobs as suppression of dutch-roll and high-frequency oscillation. G-3s also provide continuous automatic synchronization, automatic altitude control, and "level-out" and maneuver holding functions.

If you would like more information on the G-3 autopilot, why not write for bulletin GEA-5741? It's a good idea, too, to talk first with a G-E Aviation Specialist, whether you need stabilizing or complete flight control systems. *Section 210-70, General Electric Company, Schenectady 5, N. Y.*

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